SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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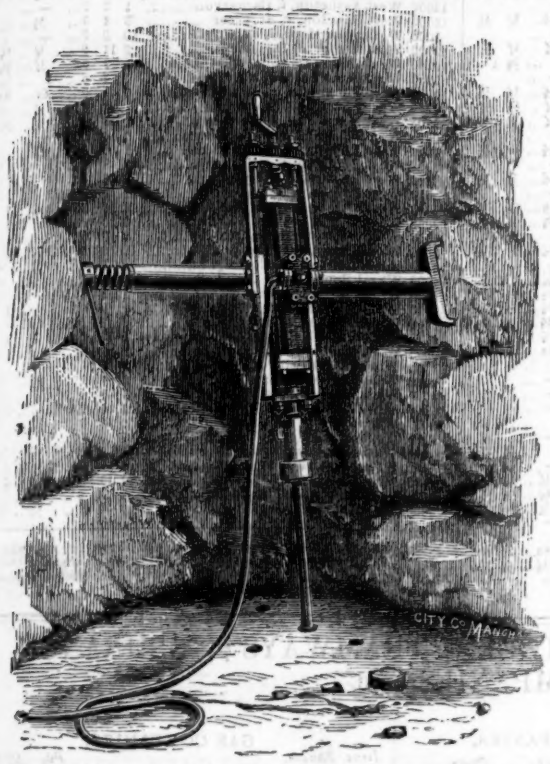
No. 2509.—VOL. LIII. LONDON, SATURDAY, SEPTEMBER 22, 1883. PRICE (WITH THE JOURNAL) SIXPENCE BY POST £1 4s. PER ANNUM.

FIRST SILVER MEDAL, ROYAL CORNWALL POLYTECHNIC —Highest Award for Effectiveness in Boring, and Economy in the Consumption of Air.

JUBILEE EXHIBITION, 1882.

THE PATENT

"CORNISH" ROCK DRILL.



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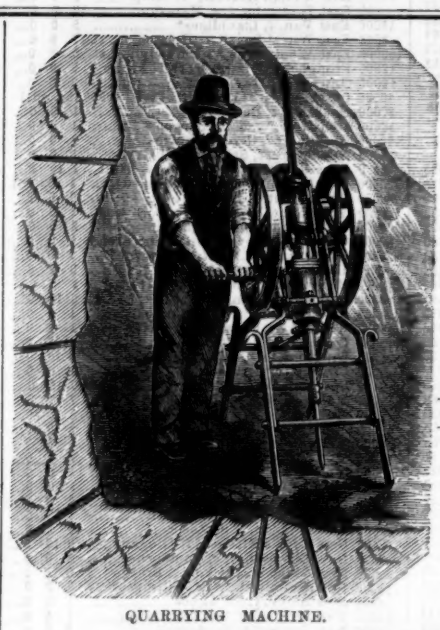

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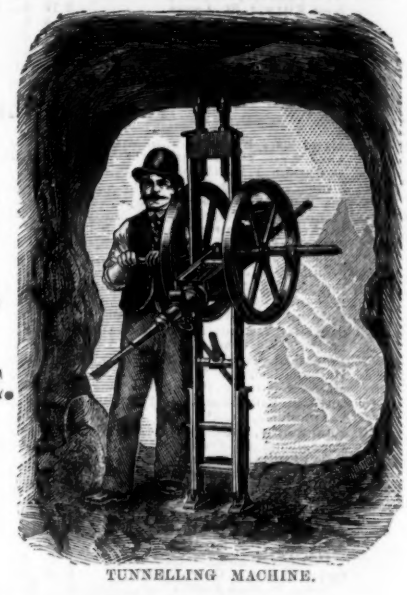

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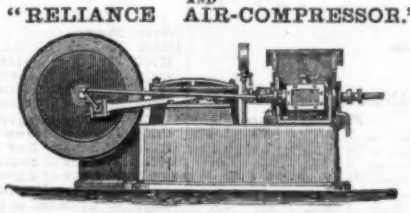

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The DRILLS are exceedingly STRONG, LIGHT, SIMPLE, and adapted for ends, stopes, quarries, and the sinking of shafts. They can be worked by any miner.

Their DRILLS have most satisfactorily stood the TEST of LONG and CONTINUOUS WORK in the HARDEST KNOWN ROCK in numerous mines in Great Britain and other countries clearly proving their DURABILITY and POWER.

About 200 are now at work driving from three to six times the speed of hand labour, and at from 20 to 30 per cent. less cost per fathom. They can be worked by any miner.

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FIRST AWARD.
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FIRST AWARD.
MELBOURNE, 1881.

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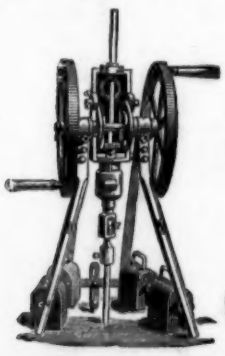
PERCUSSIVE ROCK PERFORATOR



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IN HARD ROCK.
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MacADAM'S VARIABLE TURBINE.

This Wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and in this way always assists it by whatever amount of power the water is capable of giving, and therefore saves so much fuel.

This Turbine is applicable to all heights of fall. It works immersed in the tail-water, so that no part of the fall is lost, and the motion of the Wheel is not affected by floods or back-water.

References to places where it is at work will be given on application to—

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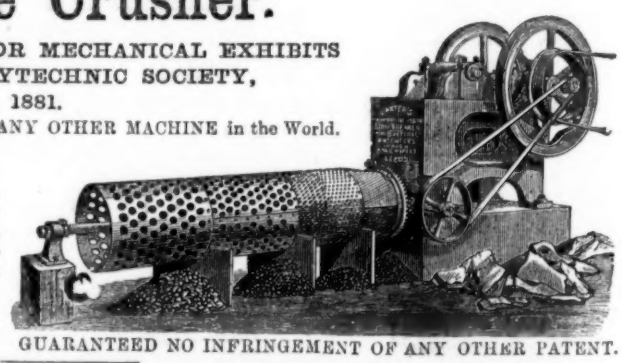
UARANTEED to do MORE WORK with less power THAN ANY OTHER MACHINE in the World.
NOTE THIS FACT.

To Mr. Baxter, Leeds. *Cinderford, Feb.* 13, 1883.

DEAR SIR,—I am pleased to be able to tell you that the Machine works splendidly. We are breaking 16 trucks a day now and we thought it a good day's work to do 10 a day with the old Machine, so you can see the difference. I had a gentleman looking at it yesterday, and he was surprised to see it work so easily. Yours truly, E. ORGAN.

The above refers to one of our 16 by 9 Machines we supplied to replace an "Improved Blake" 15 by 9 Machine.



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AWARDED THE ROYAL MANCHESTER, LIVERPOOL, AND NORTH LANCASHIRE AGRICULTURAL SOCIETY'S SILVER MEDAL, 8TH OF SEPTEMBER, 1882.

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Made to any size or gauge of rails.

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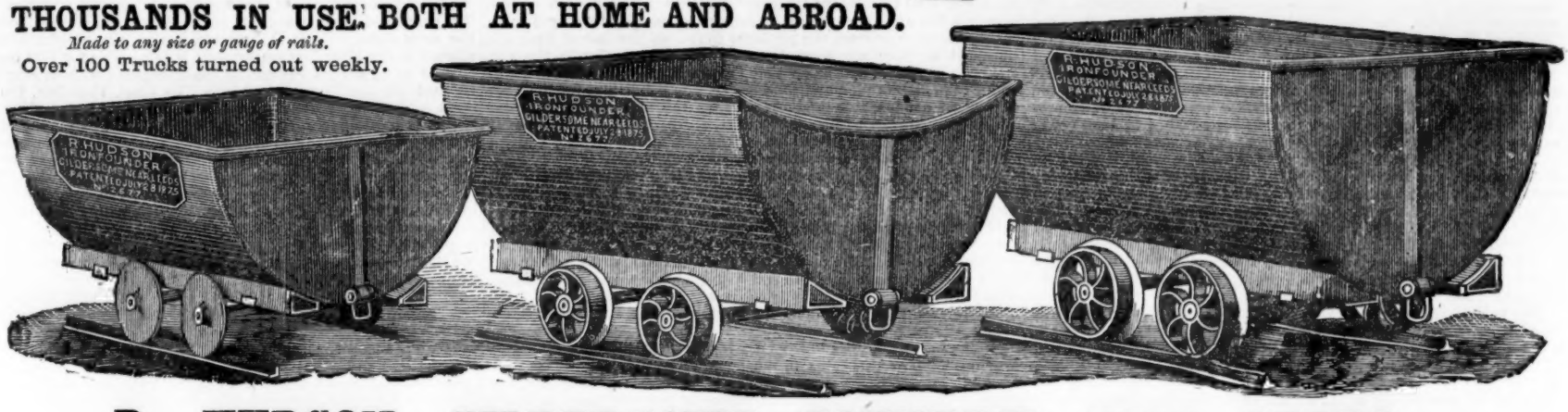

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This is the best and most economical Piston Packing in the market for High and Low Pressure Stationary Engines. Of course there are many worthless imitations of a Packing so universally approved of, but I am the Original Maker and Sole Manufacturer of the genuine article, as used in the British and German Navies. To avoid imposition, users should require to see my Trade Mark, which is on every 10 ft. length of the Packing made by me, and without this none is genuine.

TRADE MARK.

The following Testimonials refers to this Packing:—

Sewage Works, Winchester, Jan. 12, 1883.

Mr. J. Bell, Asbestos Works, London.

DEAR SIR,—I have great pleasure in saying that the Asbestos Packing I had from you is the best I have ever used, though I have used other Asbestos Packings not of your make. As an example, one of my piston rod glands was packed with it, and has been working night and day since October 26 without re-packing. I have not been able to run so long with any other make.

I am, Sir, yours truly, J. ASHCROFT, Chief Engineer.

Mr. John Bell, Asbestos Works, London. Portsmouth, February 20, 1883.

SIR,—Your Asbestos Steam Packing that you have been supplying for some considerable time I can recommend to steam users generally as being the very best that was ever introduced into the market for piston glands, slide throttle and throttle valve glands. I can after considerable experience say that it is the very best that I have ever used. We run our engine at between 80 and 90 revolutions per minute, and I may add that there is no work more trying than saw mill work.

Yours truly, WM. HATCHER,
Engineer at Bailey's Steam Saw Mills, Portsmouth.

BELL'S ASBESTOS FELT,

A cheap material to be placed between ceiling and upper floor, to prevent spread of fire.

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For Hot Water and Steam Pipes, to Prevent Radiation and Ensure Transmission of Heat; also to Protect from Frost.

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For Coating the Boilers of every kind of Marine and Stationary Engine. It is non-combustible, and can be easily and quickly applied at any time whether steam is up or not. It adheres to iron and metals and preserves them from rust.

The Maxim Weston Electric Company (Limited), 29, Bankside, London, S.E., 4th January, 1883.

Mr. John Bell, 118, Southwark Street, S.E.

DEAR SIR,—In answer to your request, I beg to inform you that I find the thermometer placed 3 feet above the boilers now stands at 93°; before your covering was put on it used to stand at 126°. With regard to the saving in fuel I am unable to speak very accurately, as the boilers were not working long enough before being covered to ascertain the amount of fuel that would be consumed in an ordinary run; but I feel quite justified in saying that we burn less by about 5 cwts. per night than we were doing, and I shall be glad at any time to show the boilers to any one who may wish to see them, as I consider yours the best covering that I have up to the present seen.

Yours faithfully, (Signed) J. H. CUNDALL, Works Manager.

BELL'S ASBESTOS BLOCKS & LUMPS FOR GAS FIRES.

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For Protection against Fire.

BELL'S ASBESTOS AND INDIA-RUBBER WOVEN TAPE,

It has been found very efficient for making bilge-pipe joints. It can be bent by hand, without puckering, to the form required, and is especially useful in making manhole and mud-hole doors; also for large "still" joints where boiling fat and acids of all kinds have to be resisted. For these latter purpose it is kept in rolls of 100 feet, in various widths from 1 inch to 2½ inches wide, by ¼ inch to ⅜ inch thick. Manhole cover joints made of this material can be lifted 20 times before renewal is necessary. This Tape is also made in any width and thickness, so that it is suitable for every class of joint. It is also made in sheets about 40 inches square, from 1/16 inch thick upwards, and each sheet bears my Trade Mark to protect users against imitations. Every 10 feet length of the tape has a label attached bearing my Trade Mark, and users are earnestly requested to see that this label is attached, to prevent imposition by worthless imitations.

The engineer of a world-renowned firm writes:—"There is not, nor can there be, any doubt as to the excellence of your Asbestos and Indiarubber Woven Sheeting—as a jointing material it is unrivalled."

The engineer of a large colliery writes:—"I would in all candour say that your Asbestos and Indiarubber Woven Sheeting is first-rate for joints. In my 25 years' experience I have not seen anything like it. I highly recommend it to all those who have to do with steam engines."

BELL'S ASBESTOS YARN AND SOAPSTONE PACKING,

For Locomotive Engines, Cranes, &c.

The following Testimonial refers to this packing:—

Festiniog Railway, Locomotive Superintendent's Office, Portmadoc, Jan. 13th, 1883.

Mr. John Bell, 118, Southwark-street, S.E.

DEAR SIR,—I have much pleasure in saying that the Asbestos Yarn and Soapstone Packing gives every satisfaction; indeed, better than we expected. We have a locomotive packed with it, and has been running five months (and think of the piston speed with our small wheels). I think the Soapstone a great improvement, as it keeps the packing elastic, and prevents it getting hard. I am very pleased with its working, and also the very low price for such good lasting packing. The Asbestos Yarn we find is very useful, and answers admirably.

(Signed) Yours truly, W. WILLIAMS.

BELL'S ASBESTOS ROLLED CLOTH PACKING,

For Marine Engines. Every 10 feet length of the above Packings has a label attached bearing my Trade Mark, without which none is genuine. The following Testimonial refers to the Asbestos Cloth Packing:—

S.S. "NORFOLK," S.W. India Docks, London, February 28th, 1882.

John Bell, ESQ.

SIR,—I have great pleasure in reporting on your Asbestos Cloth Rope Packing which you sent me on trial. I tried it in one of two H.P. Piston Rods, and it ran 90 days without repacking. The other H.P. Piston Rod was packed with a similar form of packing, not composed of Asbestos, and was repacked 10 times during the 90 days. I have recommended it both at Sydney and Melbourne, and shall do my best to take this packing in whatever steamers I may have to do with.

I remain, Sir, yours truly,
W. W. PROPHET, Chief Engineer S.S. "NORFOLK."

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD,

For Dry Steam Joints, Electric Dynamo Machines, &c.; made in sheets measuring about 40 inches square, from 1-64th inch to 1 inch, and ½ millimetre to 25 millimetres thick. Each sheet bears my Trade Mark, without which none is genuine.

BELL'S ASBESTOS CORDAGE,

For Fire Escapes and Window Sash Lines, &c.

Foreman Engineers and others in charge of Machinery are invited to inspect BELL'S ASBESTOS GOODS at any of the undermentioned addresses, or to write for particulars.

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JOHN BELL, ASBESTOS WORKS, 118, SOUTHWARK STREET, LONDON;

OR THE BRANCH WAREHOUSES—

VICTORIA BUILDINGS, DEANSGATE, MANCHESTER; 11 AND 13, ST. VINCENT PLACE, GLASGOW; 21, RITTER STRASSE, BERLIN.

SILVER MEDAL (HIGHEST AWARD) MELBOURNE, 1881.

TUBES

JOHN SPENCER,

Globe Tube Works, WEDNESBURY,

AND 3, QUEEN STREET PLACE, CANNON STREET, LONDON, E.C.

FIRST PRIZE, SYDNEY, 1880.

TUBES AND FITTINGS for Gas, Steam, and Water; Galvanised, Enamelled, and Hydraulic Tubes; Boiler Tubes and Fittings; Gas Fitters' Tools; Brass Cocks, &c.

ANTI-CORRODO TUBES AND FITTINGS COATED BY BARFF'S RUSTLESS PROCESS.

FOREIGN MINING AND METALLURGY.

The situation has not improved in France, merchants' iron having been sold at Paris at something below 7*l.* 16s. per ton. Under these circumstances the Nord will have to make fresh concessions, and if the forges are not aided by the blast-furnaces, which must make a proportionate reduction in prices, the situation will become critical. At present pig-iron is quoted in the Moselle at 2*l.* 6s. 6d. to 2*l.* 8s. per ton; this is high, having regard to the rates current for iron. The great French railway companies are beginning to give out orders to the ironworks and mechanical construction establishments. The Southern of France has just ordered from the Ariège Metallurgical Company 528 axles, to be used for carriages running in express trains. There has been no change of importance in the general aspect of the German iron trade. In Westphalia the current of affairs is stated to have experienced a diminution, especially for pig and iron; but from Silesia a rather more satisfactory report comes to hand, although no improvement in quotations is reported. Plates have continued in good demand for bridge building, boilers, and rolling stock. An adjudication for 12 tank-engines, with two axles coupled, has just taken place at Strasburg. The engines were taken by a Munich house at 1000*l.* each. The same firm also secured an order for six tank-engines, with three axles coupled, at 1100*l.* each. Annexed are current Westphalian quotations:—Casting pig, 3*l.* 12s. per ton; puddling pig, 2*l.* 15s. per ton; Bessemer pig, 2*l.* 17s. per ton; spiegel pig, 3*l.* 1s. per ton; Luxembourg pig, 2*l.* per ton; iron bars, 6*l.* 5s. per ton; fine-grained iron, 7*l.* 12s. per ton; merchants' iron, 6*l.* 18s. per ton; and boiler-plates, 9*l.* 10s. per ton.

There has been no improvement in prices in the Belgian iron trade. Orders are sufficiently numerous to keep the works generally well employed, but some small works have still blanks in their order books. The situation is probably somewhat better than it was a month or six weeks since, but there is still room for further improvement. English pig has remained at 2*l.* 6s. per ton upon the Belgian markets. Belgian casting pig has remained at 2*l.* 18s. per ton for Charleroi pig, and at 2*l.* 8s. to 2*l.* 10s. per ton for Luxembourg pig. Ordinary pig (hard iron) has maintained a quotation of 2*l.* 4s. per ton; ordinary pig has brought in consequence 2*l.* per ton, and mixed pig 1*l.* 16s. per ton. Iron has been firm and without variation upon the Belgian markets at 5*l.* per ton. The difference of 8s. per ton per number is still well maintained, so that No. 2 has made 5*l.* 8s. per ton, and No. 3 5*l.* 16s. per ton. Plates have been relatively in more demand; at the same time No. 2 cannot be carried beyond 6*l.* 16s., and No. 3 beyond 7*l.* 12s. per ton. Plates of commence have been maintained at 9*l.* 4s. per ton. A contract is stated to have been secured in Belgium for 72,000 tons of steel rails for the Government of Victoria at the extremely low rate of 4*l.* 2s. 6d. per ton; we await further details as to this important contract. Plans have just been prepared at the Roumanian Ministry of Public Works for a great bridge across the Danube, which is to unite Bucharest and Faüréi with Cernavoda and Constantza. The length of this bridge will not be less than 2667 ft. The bridge will not only have to cross the Danube, but it will also span the Borcea, an arm of the Danube on its left bank. The John Cockerill Company is stated to have obtained a contract for 9656 tons of steel rails for the Upper Italy Railway. The contract price is given at 7*l.* 2s. 6d. per ton.

The approach of winter will probably increase the strength of the Belgian coal trade. In several districts supplies have been laid in for the cold season, and household coal, already well maintained, has received a fresh impetus by the increase in the demand. At the same time, there has been no advance in rates, and all that can be said is that previous prices have been well maintained. Industrial coal has also been well supported, metallurgical industry showing a little more activity. The number of trucks laden with coal and coke which passed over the Belgian State Railways in the week ending Sept. 9 was 18,391, as compared with 18,139 in corresponding period of 1882. The Belgian Minister of Public Works will let next week a contract for 10,400 tons of forge coal. The German coal trade presents a favourable aspect, and the winter season commences under encouraging auspices. The demand for coal of various kinds is very considerable, and it is proposed to advance prices for some descriptions. For the best qualities an advance has already been established at some collieries. Deliveries are for the rest active, and the lines accommodating the basin of the Ruhr carried during July and August 200,000 tons more coal than during the corresponding months of 1882. Coke and coking coal have not been so well sustained. It is stated that Mr. Krupp, of Essen, has just purchased an extensive bed of lignites in the Westerwold district—a chain of mountains which commences in the south of Westphalia, and extends as far as the right bank of the Rhine, near Coblentz. A railway is in course of construction in the district, and will give increased value to its mineral wealth, which comprises, besides lignites, iron, minerals, copper, manganese, &c.

HOLLOWAY'S OINTMENT AND PILLS.—Sudden changes of temperature sorely try all persons prone to rheumatism, sciatica, tic-doloreux, and many similar maladies scarcely less painful, though of shorter duration. On the first attack of stiffness or suffering in any muscle, joint, or nerve, recourse should immediately be had to fomenting the seat of disease with hot brine and rubbing in this remarkable ointment, which will assuage the uneasiness of the part, subdue inflammation, and reduce the swelling. The pills, simultaneously taken, will rectify constitutional disturbances and renew the strength. No remedy heretofore discovered has proved so effective as the ointment and pills for removing gouty, rheumatic, and scrofulous attacks, which afflict all ages, and are commonly called hereditary.

THE IRON AND STEEL INSTITUTE MEETING AT MIDDLESBOROUGH.

The opening meeting of the Institute was held on Tuesday morning in the Oddfellows' Hall; Mr. Bernard Samuelson (President) in the chair. He was supported on the platform by Sir Henry Bessemer, Sir James Ramsden, Mr. Carl Bolckow, Mr. David Dale, Mr. Jenkins, Mr. T. Hugh Bell, Mr. Martin, Dowlais; Mr. Snelus, Mr. E. W. Richards, Mr. E. Williams, &c. There was a very large attendance. The first business was the discussion of papers read formerly; afterwards two papers were read on the manufacture of coke.

THE SIMON-CARVES COKE-OVENS.

The costs and results of the Simon-Carvès coke-ovens, at Messrs. Pease's Collieries, near Crook, Durham, formed the subject of a paper by Mr. ROBERT DIXON, of Pease's West, Darlington. It is supplementary to Mr. Simon's paper of 1880. The writer, having the management of Messrs. Peases' extensive coking establishments in the county of Durham, was instructed by them to visit the Bessèges Works of the Terrenoire Company, and to make himself thoroughly acquainted with all that related to the Carvès system of coking, and its applicability to the coal of the county of Durham. Having reported favourably, he was instructed to proceed with the erection of a battery of 25 ovens, with adjuncts for utilising the waste products, not exactly proportioned to the 25 ovens, but of such power and capacity as might be obviously necessary or advantageous.

There are 25 ovens, each 23 ft. long, 6 ft. 6 in. high, and 19½ in. wide, with side and bottom flues, the capacity of each oven being equal to a charge of 4¼ tons of coal. The ovens are connected to each other on the top with 10 inch metal gas-pipes, and on these mains is placed one large metal valve-box over each oven. The gas is drawn from the ovens by one of Beale's patent exhausters, which is 2 ft. 3 in. in diameter, and capable of drawing 30,000 ft. of gas per hour at 85 revolutions per minute, an engine of 3-horse power being required for working the same.

The exhauster and engine are direct-acting, and combined on one metal bed-plate. A traversing steam ram is used for forcing the coke out of the ovens, the fuel used for this purpose being 261 lbs. of coal per day, or 28 lbs. per oven. The condensing arrangements consist of 10 rows of 10 in. metal pipes in serpentine form, the length of each row being 32 ft., and above these is placed a perforated 4 in. metal pipe for spraying the water. The consumption of water for this purpose is 1000 gallons per hour. There are three cylindrical iron gas scrubbers, each being 13 ft. 6 in. high and 6 ft. 6 in. diameter, connected to each other with 8 in. metal gas-pipes; there are also connected to these scrubbers two large metal washing boxes.

Two steam-pumps are in use for pumping the ammoniacal liquor and tar, each being capable of pumping 6000 gallons of liquor per hour. Six tanks are required, each having a dimension of 16 ft. diameter by 9 ft. 6 in. deep—one depositing tank for collecting the ammoniacal liquor and tar, one for saturation, one for decantation, and three for storage.

In the construction of these ovens it is absolutely necessary that the whole of the work should be done in the most substantial manner, for unless the masonry of the ovens and flues is so constructed the gas will escape and be consumed in the flues, and air will be admitted, thus causing combustion in the ovens, and consequently a reduction in the yield of coke and bye-products.

The cost of the 25 ovens was 5660*l.* 12s. 4d., or 226*l.* 8s. 6d. per oven. The cost of adding an additional block of the same number, 25, it is estimated would be 3973*l.* 15s. 6d., or 158*l.* 19s. per oven. Hence the total cost of a block of 50 ovens would be 9634*l.* 7s. 10d., or 192*l.* 13s. 9d. per oven. In case a second series of 50 ovens were built, the cost might be taken at 8276*l.* 7s. 10d., or 165*l.* 10s. 6d. per oven. It may be assumed that 100 ovens form a complete set, and that none of the present machinery would be available for a larger number.

Up to the date of this paper the battery of 25 ovens has been working on gas 215 days, during which time 7042 tons of coals put into the ovens produced 5424 tons 11 cwts. (or 77·03 per cent.) of good coke; and the bye-products from the above quantity of coal were 43,164 gallons of tar and 195,076 gallons of ammoniacal liquor, or 6·12 gallons of tar and 27·70 gallons of ammoniacal liquor per ton of coal—the liquor being 6° to 7° Twaddell. The cost of coke burning, including all labour connected with obtaining the bye-products, amounts to 2s. 3·96d. per ton of coke; but this I expect with a larger number of ovens would be somewhat reduced. In comparing the production and cost per ton of coke in the Simon-Carvès coke-ovens with ordinary beehive ovens, I find that the yield is 15 per cent. more in the Simon-Carvès ovens, which is equal to 1056 additional tons of coke from the 7042 tons of coal. The extra cost of labour per ton of coke produced in the Simon-Carvès ovens over that of the ordinary beehive oven is 1s. 3·31d. per ton, which covers expenses connected with obtaining the bye-products.

The appearance of the coke produced in the Simon-Carvès coke-ovens differs from that made in the beehive ovens. Owing to the coke being forced out altogether, it is more in the form of large circular blocks of great strength and density; but lacks that silvery brightness which is supposed to be so essential to a good quality of coke. It is also larger than coke made in the ordinary ovens, which is drawn by hand labour, and is less liable to break in filling, in transit, or in tipping. The coke made in the Simon-Carvès coke-ovens is pushed out as soon as the carbonising process is completed, and although cooled immediately outside the action of the air tends to its duller appearance. As to its suitability for blast-furnaces or foundry purposes, I believe it to be all that can be desired, and I find that many of our foundry customers who have tried it prefer it to any other coke we have been accustomed to send them.

In my 25 years' experience in the manufacture of coke with almost every kind and shape of coke-oven, I have found by experiment that although the old beehive coke oven produced just that quality of coke that all iron smelters were best satisfied with, yet that form of oven is the most wasteful that the manufacturer can use, and that the continuance of its use is a serious national loss. The Peases' West coal being of a highly bituminous character, it sometimes expands to a serious extent when put into these red-hot ovens; so much so, that the metal doors are pressed outwards, and has given the man in charge considerable trouble; but this to a great extent has been prevented by using steel bars to fasten the doors instead of iron ones. In all other respects the ovens are simple to manage, and with care and attention any clear-headed workman is soon able to do so most satisfactorily.

RECOVERING DISTILLATION PRODUCTS IN COKING.

In his paper descriptive of his new coking process, Mr. J. JAMESON, of Newcastle-on-Tyne, explained that the Jameson process, for the recovery of the volatile products of coal during the process of manufacturing coke, is based upon the fact that in the ordinary coke-oven the progress of distillation, and finally of ignition, of the coal operated upon is from the top downwards. If, as in the ordinary process, the products of distillation be suffered to find their way to the upper surface of the charge in the oven, the intense heat there existing, and the access of air required by the process of coking, at once decomposes these products and renders them valueless. If, on the other hand, the products as they are formed are caused to pass to the lower and cool surface of the charge, and are extracted from the bottom of the oven, they may be recovered quite unchanged in constitution by mere condensation. This is accomplished by making passages below the oven floor, and laying upon these passages perforated quarles, or recessed bricks, and applying gentle suction during the process of coking by means of a pipe communicating with these passages, and coupled to an exhauster. Not only is it possible, by the process referred to, to effect the recovery of the products of distillation proportioned to the quantity of gas so withdrawn; but, owing to the fact of the distillate never being subjected to a heat higher than that at which it is formed, it may be said that almost the perfection of slow distillation is attained, and the condensable products given off approach nearly to the highest production possible in any circumstances. The importance of this peculiarity is demonstrated by the result (recorded by Gesner) of the distillation of 1 ton of Newcastle Cannel coal at a temperature ranging from 1000° to 1200°, and 1 ton of the same coal distilled at a temperature ranging from 750° to 800°. In the former there was a yield of 7450 ft. of gas, 18½ gallons of tar, and 1200 lbs. of coke; in the latter a yield of only 1400 ft. of permanent gas, but with 68 gallons of oil and 1280 lbs. of coke. There can be no doubt that the distillate, at the same temperature in each case, possessed the same composition, and was, while at that temperature, like in quantity; but this distillate, escaping from the coal, and in one case subjected to higher heat against the walls of the retort, had its oil vapours decomposed into a little more than one quarter of the quantity of tar, and more than four times the quantity of incondensible gas. In the other case the vapour was not subjected to this destructive heat, and condensed, therefore, into oil. The destructive power of heat on coal oil is demonstrated in the process of making oil gas. By the mere passage of the oil vapour in contiguity to the heated walls of a retort, it is decomposed into permanent gas and tarry residue.

In the process of making coke in the ordinary oven the rate of the descent of incandescence is from ½ in. to 1 in. per hour, and the charge of coal throughout its mass is, therefore, subjected in succession to a low and very gradually increasing temperature, and thus, by the Jameson process, the products found at the lowest heat are obtained as they are formed, being passed immediately through the mass of cooler coal below that in which they were formed, and so into the suction pipe and condenser. The conditions for the production of condensable products are thus the most favourable possible. The conditions for their recovery are equally favourable if the suction be such as to extract, as the coking progresses, enough but not too much gas from the oven.

The quality of the coke in this process is absolutely unaffected, saving that usually the percentage of contained sulphur is diminished. The quantity of the coke is also entirely undiminished, comparing results with the best existing practice—in fact, it is in several cases increased. Tar is not withdrawn from the oven, unless in very minute quantities. The fact that the process is one which at a very small cost can be applied to existing plant is a recommendation which need not be enlarged upon. It is also believed to be the only process by which bye-products can be recovered in an open oven, all others requiring a close oven.

Some difficulties arose in the introduction of the process owing to the uncertainty existing as to the commercial value of the oil produced by it, which in some respects differs from anything that has been in the market before. That difficulty has now been removed; it is readily saleable at from 2*l.* to 3*l.* per ton, and it is believed to be worth much more. The oil extracted contains many very valuable products: paraffin of very high melting point, and good lubricating oil, and when produced in quantities, without doubt its inferior fractions will be available for liquid fuel. The oil is of great value for gas making, producing a large quantity of very rich illuminating gas containing no sulphur, and requiring no purification whatever beyond washing with water. The demand for ammonia for farming purposes being practically unlimited, its value to the country as a fertilising agent is enormous; and by any process at once simple and effectual for recovery of the valuable volatile products of coal, the prospect of converting all coal for manufacturing and domestic purposes first into coke, then using the gas and coke separately for fuel and recovering the bye-products, may be said to be brought within measurable distance. The importance of the attainment of this object can hardly be over-estimated.

After the reading of these papers there was an excellent discussion on the subject. There is, of course, a considerable amount of prejudice against all innovations, and this feeling must be overcome before any new invention can be fully carried out. It appears to us that it is very clear from the experience already gained on this important question that good coke can be made by those processes, and we believe in increased quantity per ton of coal used, and at the same time valuable products are secured which in the ordinary system are wasted. The first cost of the Simon-Carvès system is very heavy, about 130*l.* per oven, while the cost of the Jameson oven is comparatively small, about 17*l.* per annum. The question at all events is one of great interest, and also paramount importance to the district, and the discussion will have an important bearing on the coal and coke industries in the North of England. What is offered is an increased make of coke, and the saving of valuable products; but there is another important question connected with the subject. On the old system of making coke only centre seams produce coal suitable for making coke of best quality, and these seams are being rapidly exhausted; it is, therefore, absolutely necessary that some process should be introduced, which will render it possible to utilise the seams in East Durham and elsewhere for this purpose. All kinds of coal have been tried by the Jameson process, and it has been found that fair coke has been produced from seams which would not coke at all by the old coke-ovens.

The excursion of the day was the visit to the blast furnaces and steelworks of Messrs. Bolckow and Vaughan, at Eston. There are here 19 gigantic blast furnaces to 10 of which Cowper's admirable stoves are attached; an enormous quantity of pig-iron is made under the most advantageous circumstances, as the ore is worked out of the adjoining mines belonging to the same company. The steel-works, however, attracted most attention; these works were commenced in 1877. They cover an area of 100 acres and embrace 10 Bessemer converters, six of them of 15 tons capacity and the other four of 8 tons. Both the acid and the basic processes are employed, the quantity of steel made by both being about 5000 tons per week. The converters are elevated about 15 ft. from the floor-level. There are 12 Siemens' furnaces for heating the ingots, each 25 ft. long by 10 ft. wide, and fitted with four doors. The ingots are charged into and drawn from the furnaces by hydraulic machinery. The cogging-mill has 39 and 48 in., and the finishing mill 30 in. rolls. There are 42 steel boilers to generate the necessary steam. This is a dry detailed description of these magnificent works, and we are quite unable to give any adequate description of the steel-making processes; they are, however, extremely grand and beautiful. When the converters are ready for discharging, the dross is blown from the top with great force, which produces an immense volume of fierce flame and tremendous showers of sparks, which extend for some distance, the convertor is then tipped over by means of cranes, and the molten glowing metal is poured into a receiver; this receiver is then moved along a way to the vessels where the first ingots are formed, the liquid steel is run into these vessels, the process giving beautiful and vivid effects. Ingots of immense size are made in these vessels, some of them being 15 in. square and of great length. This mass of steel is placed on a bogie by means of machinery, and hauled by small locomotives to the blooming-furnaces, and rolling-mills. When the glowing bar is once into the mill it is rapidly passed to and fro and lengthened, but still retains the square form and is called a billet. When a certain length has been attained it is rapidly passed to another range of rolls, when it assumes the form of a rail; here it is very rapidly increased in length, and as it coils along the ways it assumes the form of a vast fiery snake. It is here rolled generally to 120 ft. in length; but sometimes 150 ft. has been attained, and this was done to-day in the presence of the members of the Iron and Steel Institute. These immense rails are now removed, all heavy operations being effected by machinery, to the machine, when they are cut into suitable lengths, and finally rolled into the wagons by the same means. The whole of the works are covered by tramways, and all the haulage is done by means of small locomotives; horses appear to be utterly discarded. At every turn in the works large notices are posted, "Beware of the locomotive," and this caution is very necessary, as these beautiful little engines are flying about continually at great speed.

ON BLAST FURNACE ECONOMY IN RELATION TO DESIGN.

This was a paper by Mr. R. HOWSON, who remarked that there are two questions relating to the economy of iron smelting which, to the exclusion of almost every other, have occupied the attention of meetings like the present—the influence of capacity of furnace, and the influence of hot blast. The latter question has been especially forced to the front by the rapid change which is now taking place in the construction of heating stoves, and it has led to most valuable investigations of the chemistry of iron smelting by able men both at home and abroad.

It would be impossible even to allude here to all the theories which have been advanced to account for the efficiency of hot blast and define its limits: I will only refer to the most prominent one—the necessity of heating the entering nitrogen in order to prevent it from retarding the combustion by the absorption of heat. This is a plea in favour of hot blast which seems to outweigh all others; but there is another which is only secondary to it, and it is this, which, so far as I am aware, has not been properly recognised. If we take an ordinary Cleveland furnace the charge consists of, for every ton of coke, nearly 3 tons of ironstone and raw limestone. We have, therefore, immediately above the tuyeres certainly never less than 2½ times as much incombustible material as combustible. What would be the effect of these conditions if the blast were cold? In plain language we should be blowing the fire which smelts the material, and at the same time cooling the material which has to be smelted. I need scarcely point out the fact that the number of units of heat given out during combustion is an invariable quantity at all temperatures. A pound of coke may be burnt quickly at a high temperature, or slowly at a low one, or it may be burnt under conditions where the heat is absorbed and becomes latent as fast as it is generated. As regards its entire duty there is no difference in the work done. There is, however, a very great difference in its efficacy in the blast furnace, because it is possible for that pound of coke to be all burnt away and its heat dissipated without ever having reached the melting-point of iron. To treat, therefore, the work done in the hearth of a furnace as a question of heat duty alone, without reference to the temperature at which that duty is performed is a mistake of the most misleading character. High temperature in front of the tuyeres is perhaps the most important element of all in the economy of smelting. Consequently, if the incombustible part of the charge is so bulky in comparison with the combustible as to interfere with the production of the necessary high temperature (as it unquestionably does), the rational conclusion is that the blast ought to be heated to the same temperature that the ironstone has acquired in its descent to the zone of fusion. If, for instance, we suppose that temperature to be 3000° Fahr., then the blast ought to be also 3000°, if it were possible to attain to it; and here, as far as this part of the problem is concerned, would be the actual limit of economy.

There is another point to which I wish to refer bearing upon the general design of a furnace—the distribution of the charge. Let us take two imaginary sections of a charge in the neighbourhood of the tuyeres. We will suppose one to consist of an outer ring of ironstone and lime with a central core of coke, while the other has an outer ring of coke with a central core of ironstone. I need not ask the question which would be the most effective arrangement of the two when the blast is turned on, but it is really only an exaggerated illustration of what we have to aim at. We want to command the highest possible temperature in the hearth, and to do this we must have as much combustible material, and as little incombustible as possible opposite the tuyeres and above them. This desirable condition is, in a great measure, a function of the distribution of the charge. We must feed the coke as much as possible towards the sides of the furnace, and keep it there in its descent.

It has generally been supposed that the success of the modern bell and hopper is mainly due to the fact that it causes the larger lumps of stone to rebound towards the middle, and thus keeps the centre of the furnace free and open. As opposed to this view, I think there is nothing more likely to cause scaffolds than to allow the small stone and mine dust to lodge at the sides. But there is another feature in the case. The coke is lighter than the stone, and of a more clinging character, and if is shot towards the walls there is no reason why it should not remain there, unless it is diverted by some projecting shoulder. It is too much to say that all the coke should be tipped to the sides, and all the stone to the middle, but we may fairly conclude that if more combustible material occupied the outer circumference, and could be made to maintain that position down to the hearth we should then have less danger of scaffolds, the temperature at the hearth would be higher, and the reduction of the ore by the ascending gases preparatory to its fusion would be more effective. Such a distribution of the charge is only to be brought about by a careful consideration not only of the lines of the furnace, but of the size and angle of the bell; and even the possibility of gaining an advantage by modifying the present system of charging is well worth attention.

ON DIFFERENT SYSTEMS OF HYDRAULIC CRANES FOR STEELWORK.

In his paper on this subject Mr. R. M. DAELEN, Düsseldorf, remarked that among the hydraulic apparatus which are principally introduced in the mechanical installation of steelworks the hydraulic crane takes the most important place, because the capacity of production of a steelworks is in a great measure dependent upon the capacity and the solidity of the cranes. Sir H. Bessemer was the first to employ the principle of the differential ram, by which the consumption of water was considerably diminished but to this arrangement there is the objection, that the second stuffing-box is situated underground, and, therefore, not easily available for observation and repair, so that this system has not been very often adopted.

In 1873 Mr. R. Daelen, sen., found that attaching the ram to the pillar and leaving the cylinder was attended with many advantages. In Sir H. Bessemer's it was not possible to cast the ram in one piece, and so the second piece is not to be considered as indispensable; but this is the case in Mr. Daelen's arrangement, because the ram is shorter, so that there are, in fact, two guides, and it is possible for greater security to fix the top of the pillar on the walls of the building by three or four bars of iron. The cylinder being less heavy than the ram there is here a further saving of water, and this system seems to fulfil all the conditions required in practice. As introduced in several steelworks in Germany, it secures good results; but there is the objection that the great stuffing-box shows considerable friction after having worked for some time.

Ultimately, Mr. R. Daelen endeavoured to apply the principle of the American crane to an isolated standing crane. For this purpose a push is to be applied to the cylinder, because it is possible to make it strong enough to translate the reversing movement upon the foundation without augmenting the consumption of water. The ram has no side-friction, and the turning friction in the stuffing-box is avoided. The rolls are in the best possible condition, because they remain dry, and it is not difficult to protect them against dust and dirt, so that the friction of all the movements is reduced as much as possible. The weight of the falling parts is not so high as in the American system, and it becomes possible to fix the top of the crane on the walls of the building by three or four simple iron bars, which should, however, only be done to augment the security of structure. He thinks that this system will fulfil all the conditions required in practice, to the fullest extent possible and in the most simple manner.

ON A NEW FORM OF CENTRE CRANE FOR BESSEMER PLANT.

The form of crane referred to in the paper by T. WRIGHTSON, M.I.C.E., cannot be conveniently described without reference to the models or diagrams. The advantages claimed for the system are:—1. The obtaining of a much greater rake, thus enabling a much larger, safer, and more convenient pit to be used. 2. The foundations are much less costly, and the machinery is all visible and accessible, not being sunk in deep pits, as in other cranes. 3. There is a large saving of high-pressure water as compared with the ordinary English form, where the size of ram must be in excess of the area required for lifting, in order to provide strength to resist the great breaking strain brought upon the ram by the overhanging weight. 4. The turning of the whole crane is very easy, being on a steel pivot, the cylinder and post moving together, instead of (as is frequently the case) the ram being wrenched round inside the glands, in which latter case the custom is to keep moving the ram up and down as it revolves, to prevent the packing getting jammed The large loss of costly high-pressure water due to this necessity is entirely obviated in this crane.

In the afternoon the members visited the Anderston Foundry and the blast-furnaces and salt-works of Messrs. Bell Brothers, at Port Clarence. The works of the Anderston Foundry Company were established in 1876, employing 800 hands, and can produce 70,000 tons of castings per annum, mainly from Cleveland iron. Their staple productions are cast-iron chairs, sleepers, &c., and wrought-iron

and steel switches, sleepers, &c. The patent machine moulding process of this company is considered to be very successful. The Clarence Works of Messrs. Bell Brothers was commenced in 1851 with the erection of two blast furnaces, each 80 ft. in height, and varying in width of bosh from 17 ft. to 25 ft., and in cubical capacity from 11,500 ft. to 25,000 ft. Ten engines supply the blast. The hoists are worked on Armstrong's hydraulic system. The Clarence furnaces smelt Cleveland ore, which is worked by the company at Skelton and other places, while from their collieries in Durham they raise over 500,000 tons of coal per annum.

The saltworks were visited by a very large number of the members of the Institute and others, and we give some particulars about this remarkable deposit of salt, and the mode recently adopted of working it. First a bore-hole is put down 16 in. in diameter to the bottom of the salt bed, the total depth being 1120 ft. A wrought-iron tube is put in from the surface of the ground to the bottom of the hole. This tube rests on the bottom of the hole, but the greatest part of the weight is borne on a ring at the top of the hole. This outer tube when it traverses the salt bed is pierced with holes. Within it is placed a second tube, the lower part of which only is pierced with holes. Fresh water is constantly poured down into the annulas formed by the outer and inner tube, and finds its way through the holes at the bottom. The brine is raised by the pump from the bottom of the hole. (This is the general impression, but it is far from correct; the fact is, the water would rise up the inner tube to the level of the inflow, but being saturated with salt it only rises up to a certain point, the difference in weight of the two columns being as 10 to 12.) The total depth of the salt bed at Saltholme—that is, to the bottom of the bed—is 11,200 ft., and when the water is saturated with salt the brine, as it is called, rises up the inner tube so as to allow of its being pumped from a depth of 230 ft. from the surface. It is, however, remarkable that the saturation of the water evidently goes on at a given rate, as if the pumping-engine is worked over a certain rate pure water, or nearly so, is pumped, containing no salt. This experience has caused some anxiety naturally as to the ultimate success of this mode of mining the salt. There has been a considerable amount of agitation in the Middlesborough district respecting the working of this salt bed, as fears are entertained that its working may ultimately cause a subsidence of the surface. At the present moment we do not see any just cause for these apprehensions, when we consider that an acre of the salt bed will produce 200,000 tons of salt. There appears to be no immediate cause for apprehension. At Nancy, in the East of France, subsidences have taken place from working the salt bed in this manner; but in that locality the depth of the bed is only 300 ft. At the present moment there is every reason to prosecute this new industry, as the demand for salt is very great, and the difference of railway dues between the Cheshire salt field and the Tees gives the latter a very great advantage.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The present meeting may fairly be regarded as the most successful for several years past, and this must be particularly gratifying to those who feared that with the passing away of such men as John Phillips and others closely identified with the inauguration and development of the Association it would dwindle and dissolve. Up to Wednesday evening the number of tickets issued had reached about 2300, and the labours of the Hospitality and Lodgings Committee have proved to be by no means unnecessary. The Association's present resting place—Southport—is scarcely older than itself, although its acknowledged salubrity had even ere that secured it a high reputation as a health resort. In 1846 the town was given the advantage of a local authority, and in 1867 it was erected into a corporation. The population was then 14,000; it is now 35,000, and, including Birkdale (a part of the town, though independently managed), 44,000. Unitedly, their claim to Parliamentary representation is first in point of ratable value, third in point of population, and fourth in respect of area. The growth of the town is due first to the recognition of its salubrity, and next to the large population in the immediate neighbourhood, there being 4,000,000 of people within 40 miles. The radius includes Preston, Wigan, Blackburn, Bolton, Burnley, Oldham, and other large centres, besides Liverpool and Manchester. Then its inhabitants have displayed public spirit. Within 14 years the Corporation have spent 500,000*l*. In the abstract their claim to control the whole adjacent foreshore was sympathised with. On the seawall is a promenade 1000 yards in length. The pier is 4395 ft. in length, and 3600 ft. of it is traversed by a tramcar. The oldest public building is the Town Hall, appropriated to the General Committee of the Association and the mechanical section. The reception room is in the Cambridge Hall, which will seat 1500 persons, and cost 30,000*l*. The Free Library and Art Gallery are called after the donor, Dr. William Atkinson, and accommodate the Mathematical and Chemical Sections. The Winter Gardens, on which 100,000*l*. has been expended, are admirably suited for the evening meetings and the *soirées*, and the public park, namcd after the donor, the Rev. C. Hesketh, is well worthy of a visit.

The inaugural meeting was held in the Concert Hall at the Winter Gardens, on Wednesday evening, when Sir C. W. Siemens, the President for the past year, formally took the chair, preparatory to the installation of his successor, Professor Arthur Cayley, who occupies the Sadlerian chair of Mathematics in the University of Cambridge, and is a vice-president of the Royal Astronomical Society. The new vice-presidents are the Earl of Derby, the Earl of Crawford, eminent as an astronomer and as an electrician; the Earl of Lathom, Principal J. W. Dawson, of high scientific renown in Canada, and nominated by the Council on this occasion (probably in view of the intended meeting at Montreal next year); Vice-Chancellor Greenwood, LL.D., of Victoria University; and Professor Roscoe, of Owens College, eminent for his chemical researches. The treasurer is Dr. Williamson, of University College, London, also a very eminent chemist. The general secretaries are Captain Douglas Galton, C.B., and Mr. A. G. Vernon Harcourt, a vice-president of the Chemical Society; and the working secretary, Professor T. G. Bonney, of University College, London, and a Fellow of the Royal, the Geological, and the Antiquarian Societies, enjoys a high reputation in the world of science, and has the advantage of an urbanity which is fully appreciated by every member who is brought into contact with him.

Sir C. W. SIEMENS in introducing the President-elect very justly referred to Professor Cayley as one of the greatest of living mathematicians, and as a real poet in the branch of science which he had made his particular study. The retiring President also referred to the visit of the Association to Canada next year. A deputation from Canada had come over to attend the present meeting, and as 500 members had already intimated their intention of attending the Montreal meeting, there was every probability of its being a success.

The PRESIDENT (Prof. Cayley) was then formally installed, and, taking his position in front of the platform, proceeded to deliver one of the most interesting addresses which has been heard by the members for many years. Having disposed of the usual obituary remarks, and briefly mentioned the merits of each departed member, he observed that he was quite aware of the difficulty arising from the abstract nature of his subject; and if some, recalling the presidential addresses at former meetings, should wish that they were now about to have from a different President a discourse on a different subject, he could very well sympathise with them in the feeling. But, be this as it might, he thought it was more respectful to them that he should speak to them upon the subject which had occupied him, and in which he was most interested. Mathematics connect themselves, on the one side, with common life and the physical sciences; on the other side with philosophy, in regard to our notions of space and time, and in the questions which have arisen as to the universality and necessity of the truths of mathematics, and the foundation of our knowledge of them. As to the former side, he was not making a defence of mathematics, but, if he were, he should desire to do it—in such manner as in the "Republic" Socrates was required to defend justice, quite irrespectively of the worldly advantages which might accompany a life of virtue and justice, and to show that, independently of all these, justice was a thing desirable in itself, and for its own sake, not by speaking of the utility of mathematics in any of the questions of common life or of physical science. Still less would he speak of this utility before a friendly audience interested or willing to appreciate an interest in mathematics in itself and for its own sake. He would, on the contrary, rather consider the obligations of mathematics to these different subjects as the sources of mathematical theories now as remote from them, and in as different a region of thought—for instance, geometry from the measurement of land, or theory of numbers from arithmetic—as a river at its mouth is from its mountain source. On the other side, the general opinion has been, and is, that it is indeed by experience that we arrive at the truths of mathematics, but that experience is not their proper foundation—the mind itself contributes something. This is involved in the Platonic theory of reminiscences.

He pointed out that the purely imaginary objects are the only realities in regard to which the corresponding physical objects are as the shadows in the cave, and it is only by means of them that we are able to deny the existence of a corresponding physical object; if there is no conception of straightness, then it is meaningless to deny the existence of a perfectly straight line. But at any rate the objects of a geometrical truth are the so-called imaginary objects of Mill, and the truths of geometry are only true, and *à fortiori* are only necessarily true, in regard to these so-called imaginary objects; and these objects, points, lines, circles, &c., in the mathematical sense of the terms, have a likeness to and are represented more or less imperfectly, and from a geometer's point of view, no matter how imperfectly, by corresponding physical points, lines, circles, &c. In arithmetic and algebra, or say in analysis, the numbers or magnitudes which we represent by symbols are in the first instance ordinary (that is, positive) numbers or magnitudes. We have also in analysis and in analytical geometry negative magnitudes; there has been in regard to these plenty of philosophical discussion. But it is far otherwise with the notion which is really the fundamental one (and he could not too strongly emphasise the assertion) underlying and pervading the whole of modern analysis and geometry, that of imaginary magnitude in analysis and of imaginary space (or space as a *locus in quo* of imaginary points and figures) in geometry; he used in each case the word imaginary as including zeal. This has not been, so far as he was aware, a subject of philosophical discussion or enquiry. As regards the older metaphysical writers, this would be quite accounted for by saying that they knew nothing, and were not bound to know anything, about it; but at present, and, considering the prominent position which the notion occupies, say even that the conclusions were that the notion belongs to mere technical mathematics, or has reference to nonentics, in regard to which no science is possible, still it seemed to him that (as a subject of philosophical discussion) the notion ought not to be thus ignored; it should at least be shown that there is a right to ignore it.

Proceeding to consider two different ways in which without any modification at all of our notion of space we could arrive at a system of non-Euclidian (plane or two-dimensional) geometry he traced the history of the probable development of the process of reasoning according to each, in the course of which he remarked—Suppose that as a rule moves away from a fixed central point of the plane it becomes shorter and shorter; if this shortening takes place with sufficient rapidity, it may very well be that a distance which in the ordinary sense of the word is finite will in the new sense be infinite; no number of repetitions of the length of the ever-shortening rule will be sufficient to cover it. There will be surrounding the central point a certain finite area such that (in the new acceptation of the term distance) each point of the boundary thereof will be at an infinite distance from the central point; the points outside this area you cannot by any means arrive at with your rule; they will form a *terra incognita*, or rather an unknowable land; in mathematical language, an imaginary or impossible space; and the plane space of the theory will be that within the finite area—that is, it will be finite instead of infinite. They thus with a proper law of shortening arrive at a system of non-Euclidian geometry which is essentially that of Lobatschewsky. But in so obtaining it they put out of sight its relation to spherical geometry; the three geometries (spherical, Euclidian, and Lobatschewsky's) should be regarded as members of a system.

Geometry and algebra, he remarked in another part of his address, must be considered as each of them originating in connection with objects or questions of common life—geometry, notwithstanding its name, hardly in the measurement of land, but rather from the contemplation of such forms as the straight line, the circle, the ball, the top (or sugar-loaf). The Greek arithmetic was, from the want of a proper notation, singularly cumberous and difficult; it was for astronomical purposes superseded by the sexagesimal arithmetic, attributed to Ptolemy, but probably known before his time. The use of the present so-called Arabic figures became general among Arabian writers on arithmetic and astronomy about the middle of the tenth century, but was not introduced into Europe until about two centuries later. Algebra among the Greeks is represented almost exclusively by the treatise of Diophantus (A.D. 150); in fact, a work on the theory of numbers containing questions relating to square and cube numbers, and other properties of numbers, with their solutions. Astronomy is, of course, intimately connected with geometry; the most simple facts of observation of the heavenly bodies can only be stated in geometrical language—for instance, that the stars describe circles about the pole-star, or that the different positions of the sun among the fixed stars in the course of the year form a circle. Logarithms were invented, not exclusively with reference to the calculation of trigonometrical tables, but in order to facilitate numerical calculations generally; the invention is due to John Napier, of Merchiston, who died in 1618 at 67 years of age; the notion was based upon refined mathematical reasoning on the comparison of the spaces described by two points, the one moving with a uniform velocity, the other with a velocity varying according to a given law. It is to be observed that Napier's logarithms were nearly, but not exactly those which are now called (sometimes Naperian, but more usually) hyperbolic logarithms—those to the base e; and that the change to the base 10 (the great step by which the invention was perfected for the object in view) was indicated by Napier, but actually made by Henry Briggs, afterwards Savilian Professor at Oxford (d.1630). The physical, statical, or dynamical questions which presented themselves before the publication of the "Principia," were of no particular mathematical difficulty, but it is quite otherwise with the crowd of interesting questions arising out of the theory of gravitation, and which in becoming the subject of mathematical investigation, have contributed very much to the advance of mathematics.

In conclusion I would say, added the Professor, that mathematica have steadily advanced from the time of the Greek geometers. Nothing is lost or wasted; the achievements of Euclid, Archimides, and Apollonius, are as admirable now as they were in their own days. Descartes' method of co-ordinates is a possession for ever. But mathematics have never been cultivated more zealously and diligently, or with greater success, than in this century—in the last half of it, or at the present time: the advances made have been enormous, the actual field is boundless, the future full of hope.

The vote of thanks was eloquently proposed by Sir WILLIAM THOMSON and seconded by the Mayor of Southport (Mr. WOODS), who on behalf of the borough offered the Association a hearty welcome. Abstracts of some of the more important papers brought before the several sections will be given in future Journals.

NEW PASS THROUGH THE ANDES.—The recent discovery of a pass, hidden for centuries, in the mountains between Chili and Argentine Republic, near Lake Nahuelhaspi, may have a powerful influence upon the development of a region which has been one of the world's neglected corners. By this pass the route from the extreme western outpost of the Argentine Republic, across Chili at its narrowest part, to the Pacific Coast, is only 70 miles long, so that a railway can be built directly across the point of South America from the Gulf of San Matras, through the pampas, to a Chilian port at the head of the gulf which lies between Chiloe Island and the mainland. A railway is now in process of construction from Buenos Ayres, in a north-westerly direction, by Mendoza to Santiago, but the route made available by the Barilocha Pass is less than one-half the length of that one. Perhaps this discovery and the explorations of Chilian and Argentine soldiers will open to improvement the region which corresponds in respect to the climate with the United States. We are apt to forget that the greater part of America lies in the hot zone, and only the southern point, which is owned partly by Chili and partly by the Argentine Republic, lies in the latitude of the New England and Middle States, and the route through the newly-discovered pass is in the latitude which corresponds to the latitude of this city. Vast plains there await development.

— *New York Times.*

THE NEW PATENT, DESIGNS, AND TRADE MARKS ACT.—No. I.

The new Act which comes into operation at the end of the current year for amending and consolidating the law relating to patents for invention, registration of designs, and trade marks affords such greatly increased encouragement to inventors that it cannot be doubted that a vastly larger number of patents will be secured; and as a large proportion of the readers of the *Mining Journal* are of the inventive class a full abstract of the Act, clause by clause, will be generally acceptable.

PART I.—PRELIMINARY.

1.—The short title of the Act is the Patents, Designs, and Trade Marks Act, 1883.

2.—This Act is divided into:—Part I. Preliminary.—Part II. Patents.—Part III. Designs.—Part IV. Trade Marks.—Part V. General.

3.—The Act, except where otherwise expressed, commences from Dec. 31, 1883.

PART II.—PATENTS.—APPLICATION FOR AND GRANT OF PATENT.

4.—(1) Any person, whether a British subject or not, may make an application for a patent. (2) Two or more persons may make a joint application, and a patent may be granted to them jointly.

5.—(1) An application for a patent must be made in the form set forth in the first schedule, or in such other form as may be from time to time prescribed; and must be left at, or sent by post to, the patent office. (2) An application must contain a declaration that the applicant is in possession of an invention whereof he claims to be the true and first inventor, and for which he desires to obtain a patent, and must be accompanied by either a provisional or complete specification. (3) A provisional specification must describe the nature of the invention, and be accompanied by drawings, if required. (4) A complete specification, whether left on application or subsequently, must particularly describe and ascertain the nature of the invention, and in what manner it is to be performed, and must be accompanied by drawings, if required. (5) A specification, whether provisional or complete, must commence with the title, and in the case of a complete specification must end with a distinct statement of the invention claimed.

6.—The comptroller is to refer every application to an examiner, who shall ascertain and report to the comptroller whether the nature of the invention has been fairly described, and the application, specification, and drawings (if any) have been prepared in the prescribed manner, and the title sufficiently indicates the subject matter of the invention.

7.—(1) If the examiner reports that the nature of the invention is not fairly described, or that the application, specification, or drawings has not, or have not, been prepared in the prescribed manner, or that the title does not sufficiently indicate the subject matter of the invention, the comptroller may require that the application, specification, or drawings be amended before he proceeds with the application. (2) Where the comptroller requires an amendment, the applicant may appeal from his decision to the law officer. (3) The law officer is, if required, to hear the applicant and the comptroller, and may make an order determining whether and subject to what conditions (if any) the application shall be accepted. (4) The comptroller is, when an application has been accepted, to give notice thereof to the applicant. (5) If, after an application has been made, but before a patent has been sealed, an application is made accompanied by a specification bearing the same or a similar title, the examiner is to report to the comptroller whether the specification appears to him to comprise the same invention; and, if he reports in the affirmative, the comptroller is to give notice to the applicants that he has so reported. (6) Where the examiner reports in the affirmative the comptroller may determine, subject to an appeal to the law officer, whether the invention comprised in both applications is the same, and if so he may refuse to seal a patent on the application of the second applicant.

8.—(1) If the applicant does not leave a complete specification with his application, he may leave it at any subsequent time within nine months from the date of application. (2) Unless a complete specification is left within that time the application shall be deemed to be abandoned.

9.—(1) Where a complete specification is left after a provisional specification, the comptroller is to refer both specifications to an examiner for the purpose of ascertaining whether the complete specification has been prepared in the prescribed manner, and whether the invention particularly described in the complete specification is substantially the same as that which is described in the provisional specification. (2) If the examiner reports that the conditions have not been complied with, the comptroller may refuse to accept the complete specification unless and until the same shall have been amended to his satisfaction; but any such refusal shall be subject to appeal to the law officer. (3) The law officer is, if required, to hear the applicant and the comptroller, and may make an order determining whether and subject to what conditions, if any, the complete specification shall be accepted. (4) Unless a complete specification is accepted within 12 months from the date of application then (save in the case of an appeal having been lodged against the refusal to accept) the application shall, at the expiration of those 12 months, become void. (5) Reports of examiners are not in any case to be published or be open to public inspection, and are not to be liable to production or inspection in any legal proceeding other than an appeal to the law officer under this Act, unless the court or officer having power to order discovery in such legal proceeding shall certify that such production or inspection is desirable in the interests of justice, and ought to be allowed.

10.—On the acceptance of the complete specification the comptroller shall advertise the acceptance, and the application and specification or specifications with the drawings (if any) shall be open to public inspection.

11.—(1) Any person may at any time within two months from the date of the advertisement of the acceptance of a complete specification give notice at the patent office of opposition to the grant of the patent on the ground of the applicant having obtained the invention from him, or from a person of whom he is the legal representative, or on the ground that the invention has been patented in this country on an application of prior date, or on the ground of an examiner having reported to the comptroller that the specification appears to him to comprise the same invention as is comprised in a specification bearing the same or a similar title, and accompanying a previous application, but on no other ground. (2) Where such notice is given the comptroller shall give notice of the opposition to the applicant, and shall, on the expiration of those two months, after hearing the applicant and the person so given notice, if desirous of being heard decide on the case, but subject to appeal to the law officer. (3) The law officer is, if required, to hear the applicant and any person so giving notice and being, in the opinion of the law officer, entitled to be heard in opposition to the grant, and shall determine whether the grant ought or ought not to be made. (4) The law officer may, if he thinks fit, obtain the assistance of an expert who shall be paid such remuneration as the law officer, with the consent of the Treasury, shall appoint.

12.—(1) If there is no opposition, or, in case of opposition, if the determination is in favour of the grant of a patent, the comptroller is to cause a patent to be sealed with the seal of the patent office. (2) A patent so sealed is to have the same effect as if it were sealed with the Great Seal of the United Kingdom. (3) A patent must be sealed as soon as may be, and not after the expiration of 15 months from the date of application, except in the cases hereinafter men-

tioned, that is to say—(*a*) Where the sealing is delayed by an appeal to the law officer, or by opposition to the grant of the patent, the patent may be sealed at such time as the law officer may direct. (*b*) If the person making the application dies before the expiration of the 15 months aforesaid, the patent may be granted to his legal representative and sealed at any time within 12 months after the death of the applicant.

13.—Every patent is to be dated and sealed as of the day of the application: Provided that no proceedings shall be taken in respect of an infringement committed before the publication of the complete specification: Provided also, that in case of more than one application for a patent for the same invention, the sealing of a patent on one of those applications shall not prevent the sealing of a patent on an earlier application.

PROVISIONAL PROTECTION.

14.—Where an application for a patent in respect of an invention has been accepted the invention may during the period between the date of the application and the date of sealing such patent be used and published without prejudice to the patent to be granted for the same; and such protection from the consequences of use and publication is in this Act referred to as provisional protection.

Original Correspondence.

PRODUCTS OF THE SOUTHERN ATLANTIC STATES.

SIR,—During spare moments at the National Mining and Industrial Exposition of Denver the writer took the opportunity of making a thorough examination of the extensive and well appointed exhibits of the Richmond and Danville Railroad Company, in charge of Mr. C. C. McPhail, chief of the Bureau of Mines and Manufactures connected with the above great systems. To this gentleman's courtesy, the information from which this is written, aided by the large variety of specimens placed on tables and in cases for public inspection, is due. Thinking your readers may gain some information that will interest them, I take the liberty of forwarding this letter for insertion in your valuable paper.

The company controls over 2000 miles of line, traversing the immense territory covered by the States of Virginia, North Carolina, South Carolina, Georgia, Alabama, parts of Mississippi, and destined to reach Texas through Arkansas, subsequently connecting with other great roads which will cause immense traffic through the Southern States, and build up an extensive export trade over and above supplying the large internal demand. The vast coal fields, with adjacent deposits of the finest quality of iron ore cannot fail to bring the Southern Atlantic States into brisk competition with the more advanced northern centres of produce and manufacture. It is with this view that this enterprising railroad company are at such pains to show accurately by exhibits and statistics the stupendous wealth that can be derived by the proper investment of capital throughout the country, the towns of which are so completely linked together as to form almost a labyrinth of rails.

A work by Messrs. Campbell and Ruffner, giving details of a physical survey in Georgia, Alabama, and Mississippi along the line of the Georgia Pacific Railway gives a fund of information, and should prove very valuable to those who may contemplate an investigation of the resources of these Atlantic States, while the catalogue of exhibits made by the Richmond and Danville Company at the Atlantic Exposition gives a very complete list of the minerals, woods, and agricultural products belonging to the country in question.

The exhibits in Denver are arranged on a series of tables covering a large space, with one cabinet containing rare and valuable specimens. We will first notice the specimens from the Richmond coal basin of Virginia, where tertiary coals occur in immense quantities and different thicknesses; they are solid bituminous and coking coals, with but little ash, having a lustrous appearance, and breaking into cubical masses. The same Tertiary beds occur in Stokes and Rockingham Counties, North Carolina, to which a branch line is projected. The immense quantities of coal here are now only used for local purposes. In connection with these coals there are large deposits of magnetite and hematite exceedingly pure in quality. Some of these occur in the metamorphic rocks, while others are in beds. The various other ores resulting from decomposition are in abundance.

The magnetites are black and heavy, the ore from different veins, however, showing considerable difference in texture. Some of the limonites are so pure that they are reduced by the old catalan furnaces at a profit. They contain neither titanic acid nor phosphorous. This ore carries about 57 per cent. of metallic iron, the magnetites from the same locality from 61 to 62 per cent., while the hematites from Orange County containing 61 per cent. are now largely worked. The micaceous irons are represented by some very fine specimens from Watanga County, North Carolina, another decomposed hematite ore carrying 68 per cent. of metallic iron, and but 14 1000 of 1 per cent. of phosphorous, renowned for the manufacture of Bessemer steel, occurs in large quantities. A remarkable feature in its physical condition is the fact that the mine is mostly a black sand mixed through small masses of the solid hematite, making it very easy to work. The Yellow Ridge Mines of Gaston County, North Carolina, containing 66 per cent of metallic iron, are largely worked, the ore occurring in a fissure vein in a metamorphic rock. The main shaft is down 140 ft. Near the railway passing through Davidson County, North Carolina, spathic iron of great purity is found in immense quantities—at present but little worked. One vein of iron ore in Gaston County, North Carolina, is a pure magnetite containing neither phosphorous nor sulphur; this lode is 40 ft. wide. Black band similar to those occurring in Scotland are found in the Tertiary coal field referred to in large quantities, and is valuable as containing part of its own fuel. The chromic irons that are shipped to Europe for the manufacture of bichromate of potash are from Madison, Jackson, and Yancey Counties, North Carolina. In connection with the iron ores a large number of ochres occur of every colour, and are largely used in the arts. Barytes used for adulterating white lead are also abundant.

The clay countries are likely to become the centres of great porcelain and pottery works, the materials being almost inexhaustible, and the quality sufficient for almost any variety of ware. Kaolin occurs in large quantities; the felspars, quartz, and aluminous materials are found in proximity at points which, in days to come, may be the seat of large manufactories. The metamorphic rocks of Virginia and North and South Carolina produce extremely fine varieties of graphite, which are but little worked at present, specimens of which are exhibited. Copper ores are found in abundance, and the series on exhibtion show that they are of a rich and valuable quality occurring in large quantities. The chalco-pyrites assay about 30 per cent. of copper and $32 in gold. The surface ore is frequently gossan and rich in gold. The Ducktown Mines of Tennessee yield considerable quantities of red and black oxide of copper; they have been worked for many years, notwithstanding that they are situated 60 miles from a railroad; this is now the objective point of the Western North Carolina Railway. The copper pyrites from Davidson County, North Carolina, contains 47 per cent. of copper, there being considerable oxide in the mass, while gold occurs to the amount of $7·50 and silver $17. Some of this ore is matted and shipped. Bornite and chrysocolla are also amongst the ores, while native copper from Granville County, North Carolina, shows the presence of an eruptive dyke.

The Great Ore Nob Mine, in Ash County, N.C., contains chalcopyrite and pyrrothite; they have large reduction works for smelting and refining. In quantity this ore is said to rival the Calumet and Hecla. In quality the only troublesome material to contend with is sulphur, there being neither arsenic nor antimony. Copper glance of great purity, from Person County, North Carolina, occurs in quantity; it assays 77 per cent. of copper and about 50 ozs. in silver per ton of 2000 lbs. Some chalco-pyrite on exhibit is remarkably bright, and very similar to the ore produced from the Cape Copper Mines, South Africa, while the glance will compare with the celebrated anaconda ore of Butte, Montana.

Nickel occurs in the form of an incrustation as the green hydrous silicate, much like that from New Caledonia, known as garnierite, which has so largely glutted the home and foreign markets.

But few silver ores are shown. They, however, occur abundantly in particular districts not intersected at present by the company's lines; but the argentiferous galenas, of which specimens are shown, are not more than from five to ten miles from the main line of the Richmond and Danville Railway. Specimens from the Silver Valley Mines are shown, and represent a fine grained galena, containing zinc, and are valued at $60 per ton. These mines are located in Davidson County, North Carolina.

GOLD ORES.—At the Howard's Mine, in Rowan County, the copper pyrites is sometimes very rich in gold, specimens having high assays. Much gold ore occurs in a copper slate; the former is thrown aside to be treated at some future time, while the slate is crushed and the gold saved. In Salisbury County, N. C., some fine free milling ores are found.

The Bright Light Gold Mining Company, in Union County, N. C., have an exhibit of honeycomb quartz, which mills from $50 to $60. One specimen from the Capp's Mine, near Mecklenberg, shows quantities of the pure yellow metal.

CORUNDUM.—This group represents a very important industry in the arts. So far the largest supplies have been derived from the coast of Malabar; but here there are large quantities, wherewith the home trade can be abundantly supplied, as well as the foreign markets. What is extracted in this region is shipped to Massachusetts, and there made into the emery of commerce and other polishing materials. With this a mineral of the hornblende family called bronzite occurs, some crystals being very fine mineralogical specimens. At times some very fine sapphires and emeralds are found, some fine specimens of which are placed in the cabinet.

SOAPSTONES.—These talcose minerals are abundant in the Carolinas steatite or French chalk—a fine hard variety used for the tips of gas-burners.

SLATES.—Very fine roofing slates are quarried in Virginia, numbers of men being employed who formerly worked in the Welsh quarries.

BUILDING STONES.—Amongst these the granites are most important, one block cut and polished, is a very handsome fine-grained variety, of the finest quality. Of marble, a flesh-coloured variety is almost unique, and extremely pretty for ornamental purposes, some large slabs being on view.

MICA.—The North Carolina micas are largely worked, and found of all sizes; they are a little smoky, but sufficiently white for all purposes of commerce. Nearly all used in this country comes from these quarries.

The next three tables are covered with the minerals from the States of Georgia, Alabama, and Mississippi from points along the line of the Georgia Pacific Railroad. The geological strata noticeable throughout this line of country are principally represented by Archæan rocks, the Cambrian, Silurian, Devonian, carboniferous, and Tertiary formations, each of these producing some material of value in the economic arts. Of the mineral resources, the iron and limestone ores are at present the most important of the manufacturing industries in this belt of country.

The ores of iron are of several varieties, a fine series being on the tables open to inspection, and represented by magnetite, magnetic ore, hematite, red and specular ores, limonite (brown hematite), sidente, in forms of spathic, clay, ironstone, and black band. Other ores are found, but these varieties are those mostly used for the manufacture of iron. Iron pyrites are used to some extent for the manufacture of sulphuric acid. The Archæn Region, from Atlantic Georgia to the margin of Choccolocco Valley, in Alabama, produces of the specular and magnetic ores in large quantities. Near the eastern margin of Haralson County in the neighbourhood of the Hughes Copper Mine there is a vein of magnetite of fine appearance, while about two miles from Buchanan a bed of specular ore, of the micaceous variety, crops out about 3 ft. thick. The Anniston Valley, a branch of the Great Silurian Valley, of Coosa, brings us into another extensive ore region. At Anniston the Woodstock Company's furnaces are in active operation for the manufacture of charcoal iron. This region shows one of the best ore fields in Alabama, which are mined on a large scale. Associated with these ores is a bed of manganese ore, the extent of which is not yet determined; it has been successfully tested at Woodstock furnace in making spiegeleisen. The iron ores that border the coal fields not only have an abundant supply of fuel, but limestones in great abundance well suited for furnace flux, as well as other materials used in the various iron manufactures.

Amongst the other valuable minerals those of gold, silver, copper, lead, &c., occur in considerable quantities; the latter, however, are not very extensively mined.

The great gold belt of the Atlantic slope, as it has been called, extends from near the Potomac, in Virginia, through the Piedmont County, east of the Blue Ridge, entirely across North Carolina and Georgia, and into Alabama. Most of the gold has been mined from the river gravels, but some fine specimens of quartz are shown from several reefs.

LEAD.—The metal is found in the form of galena, and exists in Cahoun County, Alabama. The Old Draper Mine lies a few miles west of Jacksonville, and the ore is found in the dolomitic limestone of the Quebec Ages.

The copper is considerably worked, and chalcopyrite the principal ore. It seldom crops out at the surface, but is usually covered by an iron cover known as gossan or iron hat. The copper belt of Georgia and Alabama possesses some promising features, and is already attracting considerable attention.

The Georgia Pacific Railway runs for about 100 miles across the richest part of the Alabama coal field. It has an estimated area of 5400 square miles, and is the southern terminus of the Appalachian coal field of the carboniferous formation. The coals are of excellent quality, and the seams are from 3 to 10 ft. in thickness.

The exhibit of woods is very fine; the great variety is remarkable. Numbers of slabs are nicely cut and polished, showing the texture and beauty of the various specimens. The proportion of forest to cleared land is, probably, about three to one. The forests from which these specimens were taken are situated in North Carolina, South Carolina, and Georgia, and embrace vast areas of original growth, from which but little has yet been taken, save what has been needed to supply the demands of a purely local character. Some of the handsomer woods noticed were the black oak, red oak, curled pine, curled walnut, the different maples—as birdseye, striped, curled, white, and many others; hickories, birch, cherry, laurel, and many varieties of rare woods valuable for cabinet making and other uses in the manufacturing arts.

Amongst the rarer features of the mineral display must be noted the cabinet specimens and gems which seem to abound. Even diamonds are met with, and some very valuable specimens have been found in the Itacolumite sandstones of the country. The Oriental sapphire, topaz, and emerald are sometimes found amongst the more common corundums and emery. A number of very beautiful green crystals of biddenite were open to inspection. They are a new and rare emerald, and found only in North Carolina.

Garnets are found in abundance in the metamorphic rocks, while some specimens of magnetite were filled with garnet crystals. Some remarkable specimens of quartz are shown, enclosing circular crystals of asbestos and rutile. The rare elements are found in the minerals—samarskite, which contains niobium, iron, uranium, thorium, zirconium, and yetrium, combined with lime and magnetite. The rare columbite is represented by a large black crystal, which is a combination of niobic and tantalic acids, with iron and manganese. Zircon is also shown, and many other specimens of extreme interest to the scientist and lover of gems.

The display of the Richmond and Danville Railroad system is one that cannot but attract the attention of all who have the interest of progress at heart. This enormous district would appear to be a paradise for the manufacturer and worker in arts. Judging even necessarily from the imperfect account of its resources based on a mere inspection of the exhibits at Denver, it is obvious that the States of Virginia, North and South Carolina, Georgia, and Alabama will at no distant date become world-renowned for the production of all the materials essential to the iron and mining industries. The agricultural resources are, it would appear, equally unlimited; but so far the collections of bright tobaccos in the raw state from North Carolina and Virginia are especially interesting, and although no cotton is shown, the unequalled production of these states is sufficiently known to render such an exhibit almost superfluous.

Denver, Aug. 29. —— N. W. R. READ, F.G.S.

AUSTRALIAN MINING—NEW ZEALAND IRON SAND.

SIR,—What fortunes we colonists have in the dust under our very feet sometimes, and miss the chance of, though our ignorance of their real value was brought home to me very forcibly the other day by coming across the subjoined paragraph from a New Zealand paper with regard to the Onehunga iron. It says—"Mr. Gardner, the manager of this company, whose works will cost from 80,000*l.* to 100,000*l.*, has been paying a visit to Christchurch, and brought with him some specimens of the iron to be tested. This has been done by Mr. John Anderson and Mr. A. G. Howland, both with very satisfactory results, as I will now proceed to show. Mr. John Anderson writes to Mr. Gardner that he has tested the iron made from the Onehunga iron sand by bending, twisting, punching, &c., and finds it to be in every way a high class iron, and in his opinion superior to ordinary imported iron. This sample has been on view in Mr. Nashelski's window in this city. Mr. Howland has had a bit of the iron made into a rough chisel, the first probably ever made in the colony from colonial iron; it was forged in the usual way, hardened by being plunged into cold water, and then ground sharp. The edge, considering that the tool was only of rough iron, is a remarkably good one, the grain of the metal being very fine and close, so that the experiment is considered very satisfactory, for if the rough iron is of such quality, what may not be expected of steel made therefrom? Mr. Howland sent some of the pieces to Mr. Hill, of Sydenham, to try; he made some horseshoe nails of it; they are stiff, with a fine sharp point, and will bear almost any amount of driving. One when cold was curled up from the point to the head without showing any sign of breaking; another was twisted when cold till it resembled a cork-screw, without showing any signs of cracking. Mr. Howland considers that the iron when properly rolled or manufactured would be equal to the best Swedish, and he intends placing the nails, &c., the experiments on which he has conducted himself, in the rooms of the Christchurch Industrial Association."

The sting of the "might have been" to me in the above lies in the fact that some 25 years back, when our schooner the Kate Kearney was running the mails between Sydney and Taranaki, New Zealand, she brought back with her a few tons of the iron sand from Taranaki beach, the master thinking that from its great weight it must be a very rich ore. We tried it in the usual perfunctory way of busy colonists dealing with things outside their ordinary knowledge; and as I was assured by the blacksmith (we had no Mines Department in those days) that it "would'nt pay to smelt," I let the matter pass, and forfeited the deposit that the master had paid to the New Zealand Government on account of a lease to secure the whole area of it; and as the Taranaki deposit is some ten times more extensive and more easily worked (from its safer harbour) than the Onehunga one, I now wake up to "what might have been," if I had only gone on paying the rent. It is the inevitable and cute Yankee who has realised the value of this sand, and started the above works (either in connection with or by the advice of Dr. Siemens, of New York, I think), and some of his countrymen (cuter still) are now trying to secure from the present lessees the right to work the Taranaki deposits, which if they succeed in will find them work to do for generations to come. I should say, for the whole beach to a depth of several feet, by a width of probably 300 ft. and for about 20 miles in length, consists of this iron sand, which contains by analysis 70 per cent. of pure metallic oxide.

It now seems that why our original experiment failed in Sydney was from the presence of titanite in the sand, resembling in that respect the Canadian iron sand, which has lately attracted so much attention in America. Since Dr. Siemens, with the aid of Edison's ore separator, so successfully smelted it in his furnaces at Landore, and finds that it will economically make about the best steel in the world, and as the Taranaki deposit is so vast, and coal close by at about 10s. per ton to work it with, I expect if the Yankees do secure the concession we shall even hear of their offering to supply the Sheffield and Birmingham cutlers with steel, especially as it will go to England at a low or merely nominal freight as ballast for the wool ships. In Sydney the ship often pays 5s. per ton for copper and tin ingots to be allowed to carry them for this purpose—in fact, at the present time America is evidently more awake to the opening here for successful investment of spare capital than England seems to be, as the short run of only about three weeks from San Francisco to the colonies enables the far-sighted ones of the Pacific Slope to easily "visit the land and spy out the fatness thereof," and invest accordingly.

The subjoined extract from to-day's Sydney Morning Herald shows that the once famous Hawkins Hill gold deposits are not quite worked out yet, and, in fact, it is the opinion of many old miners here that if the hill was cut right through at a depth it would again yield well, and possibly better, than before even. A correspondent telegraphs from Hill End—"There is intense excitement here owing to another discovery of gold. Longton has just placed 205 ozs. of gold in the bank, being the proceeds of only half a tin bucket of stuff, which was taken up at 4 ft, from the surface." The mining manager of the King's Tin Mining Company (no liability), under date July 19, reports as follows—"Since last report have raised about 30 tons of good stone; total now at grass and at liberty, 276 tons. In No. 1 shaft the level has been driven 10 ft.; the quartz is very hard, and being out of dynamite have not made as much progress as would otherwise have done. A fresh supply will be on the mine in the course of a few days, when work will go on better. Very little work has been done in No. 2, as the men were taken off to cut timber for the buddles. No. 3 shaft is now sunk 23 ft., and splendid stone being raised from this shaft. The foot or hanging walls have not yet been reached."

The last paragraph refers to one of our lode tin mines; this latter class of mining now beginning to take the place of the alluvial or stream tin mining, just as was the case with our gold deposits; and our Government geologist, Mr. C. S. Wilkinson, F.R.G.S., has lately been all through the tin districts pointing out the more likely spots for prospecting for lode mining, &c. R. D. A.

Sydney, July.

THE ANNEXATION OF NEW GUINEA.

SIR,—The answer given by Lord Derby to the joint request of the Agents General, as representatives of the Australian colonies, for a re consideration of the above question by the Government will be received in Australia with much disappointment and disapprobation that will engender a general feeling of disgust throughout the colonies, at what appears to be the utter indifference of the English Government as to the future interests of the colonists on a question of vital importance to themselves, that can scarcely be comprehended or understood by the bulk of people in this country. Throughout the Australian colonies and New Zealand a unanimous feeling exists as to the undesirability of allowing New Guinea or other unoccupied islands adjacent thereto to fall into the hands of any foreign powers, or to be made the receptacle of the vilest portion of French criminals.

There is a strong under-current of opinion and fixed determination in the minds of the colonists, especially amongst the rising generations who know not England, and care but little for perpetuating a connection that will be treated with indifference. As an instance of the feeling amongst young Australians on the annexation question, a school-boy in Melbourne (under 14 years of age) writing to his father in England, says—"Are you not ashamed of your Premier (Mr. Gladstone) at not annexing New Guinea. We all think it a great shame out here. Some people think there will soon be another American trouble; but instead of America it will be Australia." Is it any wonder that this annexation question is considered of the deepest importance, not only to the present but the future prosperity and peace of the colonies, whose inhabitants are determined to adopt means of self-protection from having their society permeated with the offscourings of continental prisons?

There is probably no country in which matters of political interest are studied so earnestly as in the Australian colonies, or where a higher order of intelligence permeates a community, especially as

regards anything directly affecting their welfare. A question like this of the annexation of New Guinea, and protecting their extensive shores from being inundated with foreign criminals, will be discussed in every home, and wherever a few people congregate it will become a matter of general conversation. Is it any wonder that intelligent school-boys also discuss the question, and take a deep interest in what is there considered a burning question?

A conference of representatives of the several colonies is about to be held in Sydney shortly to fully enter into the question of annexation, and agree upon a line of policy for mutual co-operation in further pressing their wishes on the English Government and Parliament, which if persistently refused will soon lead to federation, and ultimate separation. If the blind obstinacy of English ministers reject the urgently expressed wish of the colonists as to affording protection or annexing New Guinea, then will come the question of the colonies amongst themselves adopting a policy that will have the effect of preventing any foreign country taking possession of the southern portion of the island as against them. It is to be hoped that many of the colonists residing in England, through the Royal Colonial Institute or by other means will strengthen the hands of the Agents General in pressing the wishes of the Australians on the Colonial Secretary and Premier. THOMAS CORNISH.

MINING ON THE GOLD COAST.

SIR,—Under the above head reference is made in last week's Journal to the rumour of disturbances amongst the Ashantees, and to the possibility of the mining interests on the Gold Coast suffering therefrom. Allow me to assure your readers that there never was a time when the mining colony was more secure from Ashantee raids. There has been for some little time a disposition on the part of certain head men to bring back the deposed Koffee Kalkali to the throne; but there is very little or no chance of their success. That some amount of fighting may prevail in the neighbourhood of the capital (Coomassie) for a month or two during the dries is probable; but it will no more affect the mines or the Gold Coast Colony than it will London or Liverpool, whilst the division of interests caused will tend to keep Ashantee politics confined to home rather than to outside affairs. With regard to the message said to have been sent by Koffee Kalkali to the authorities at Cape Coast, I do not know by whom the said "message" was invented; but I most distinctly deny that any such message was ever sent either by the deposed Monarch Koffee or by the present King Mensah. I might say, in conclusion, that it would take a force quite out of the power of the present king to collect to get within 100 miles of the mining district of Wassaw. I know the country well, and the different conflicting interests existing there; and I know that the last thing desired by either party would be a collision with the British Government. H. C. C.

Fairford, Sept. 17.

MINING ON THE GOLD COAST.

SIR,—I was very glad indeed to find from "W. J.'s" letter, in last week's Journal, that I am not the only shareholder in the Guinea Coast Gold Mining Company who continues to take an interest in this question, and I agree with him that it is high time the shareholders were informed by a reliable authority whether they have a property worth working or not. According to the prospectus and the reports of Commander Cameron and Mr. Burton we have a property second to none on the Gold Coast, and one that if properly managed should give very large returns; but our directors seem to be utterly apathetic, and beyond the meagre information afforded at the general yearly meeting no intelligence of a satisfactory nature is forthcoming.

The company informed me in May that they had "received good news from the mines by telegram, the full particulars of which were on the way, and would be communicated to the shareholders on being received." And again in July they wrote—"Our manager informs us by the mail just in that active operations are going on at the mine, respecting the result of which he is very sanguine. We are awaiting a more detailed and fuller report." I assume that the details are still on the way, and with a view of obtaining an honest straightforward statement as to our prospects I beg to second "W. J." proposal "for an extraordinary meeting, and a full, fair, and free explanation of our position." One annual general meeting is certainly insufficient.—*Manchester, Sept.* 17. R.

AKANKOO GOLD COMPANY.

SIR,—I have read Mr. Ross's letter describing the hill where the mining is being carried on as a "blow out," and ask the insertion of this letter in support of Mr. Ross's theory. The hill where the tunnel is being driven is in form a truncated cone, or, as Mr. Lane says, like a sugar-loaf with the top cut off. We have heard Mr. Ross's description of the so-called ferruginous conglomerate and alleged mullocky pay-dirt, and of the absence hitherto of any country rock. All this shows clearly that there has been an upheaval, and a slide has been mentioned as apparent. It may be and I think is probable that the hill was caused by an extinct volcano, as there is scoriæ in the neighbourhood in some quantity, as Mr. Ross assures me. The slide may then be only apparent, and the effect caused by the giving way of the mouth of the crater at the weakest point owing to the explosive force developed at some ejection of the scoriæ when it has poured forth from the point referred to. So long ago as October, 1882, I wrote to the present board referring to the evidence of igneous action on some pieces of the quartz, and urged that Mr. McCarthy should be called in, as he was on the coast. What can be accomplished but waste of our resources by present management? H. GETHING.

London, Sept. 19.

AKANKOO GOLD MINE.

SIR,—To the investing world and to the members of this company I believe, and I heartily hope, that I have done no dis-service. I know nothing of up and downs, "bulls" or "bears." I am a miner; it is my trade or profession, and in no manner of way do I diverge to injure another in his business. Business alone has led me in the way of Mr. Gowans, the board, and Mr. Lane, and I am content to treat with them on business matters. To the shareholders of this company, as I am on the eve of setting out on my voyage, I say—Read Mr. Lane's reports and letters—read them succinctly, without long intervals—and your eyes will be opened yawningly wide. I was with the company as foreman miner when the first machinery was ordered, and when the second lot was ordered also. This second lot was ordered before the manager had ever been to Africa, much less had he seen the mine. My word! I ejaculated, this is a clever fellow—an omniscient? when Mr. Gowans followed to give advice. Shock No. 2: I knew Mr. Gowans in Australia, and some of my congeners from the Antipodes, now here, knew him too. I said nothing against Mr. Gowans in business, and nor say, nor insinuate more than this, as he chooses to intermeddle here as a critic and expert, that the longer he lives the more he will learn; and experience is useful, and there is abundance of room for him. But, to be generous, he may teach Mr. Lane something. But, momentarily no doubt, the grand conceptions of Mr. Lane, imitative of the Great Napoleon, minus the brains, lying *perdu* in the Akankoo Mine itself (see Mr. Gowans' report of June 1), struck him with awe. I dare say the original board will remember that I objected to tunnel where Mr. Lane suggested, unless it were distinctly understood I should not be responsible for the point of attack. This the board thought only reasonable, and Mr. Lane, having selected the locality, I commenced the approach to it, first pointing out the objections. However, before I had completed the approach to the tunnel, I was superseded for incompetency, and so my connection with Akankoo, as foreman miner ended, and I have lived to tell the tale.

I am sorry to be compelled to add that some of those wharves, stores, and houses at the mouth of the Ankobra, and so impressive to Mr. Gowans, are built and lying on ground claimed by the French Company having an office in London—for further information inquire of them. All this would not very much matter if the board were alone suffering, and not the shareholders.

To relieve the ponderosity of my literary efforts, I will relate a little anecdote, which to some of my readers may raise up an analogue. One day the directors of a gold company received very flourishing reports, gold ore, gold earth everywhere, and naught else to behold, and, as a proof, quartz and mullocky pay-dirt accompanied the reports. The directors, as careful prudent men, consulted those whose business it was to know all about these things, and received an answer in effect. Quartz and pay-dirt everywhere, but not a speck of gold; and the directors sent out the flourishing reports, but as careful prudent men sent nothing more. The moral let each evolve for himself. JAMES B. ROSS.

Ealing, Sept. 17.

BRATSBERG DIVIDEND.

SIR,—It is not the smallness of the dividend in Bratsberg, as your Peterborough Correspondent seems to think, that some of the shareholders have objected to; but the disappointment has been to find that an "axe" (to quote your Correspondent's own word) like Bratsberg should require such a palpable grind (for the shares), as a small interim dividend before the many advances of the company made since October last have been repaid by the present and coming sales of ore. These advances cannot have been less than from 10,000*l.* to 12,000*l.*, and have to be recouped by sales, which at present have reached about 7000*l.* And, further, at the late meeting of shareholders, reported in the *Mining Journal*, the agent led us to expect a considerable outlay for machinery, steam vessels, &c., before any large or permanent profits could be made, and these may be a heavy drag upon the small cash capital of the company. I have nothing to say against the ultimate success of the mine. I trust it may be great and permanent; but at present I have no doubt, as your Correspondent observes, it is difficult to form a conception of its magnitude by mere conversation with those who have their "own axes to grind." But it is also evident that Bratsberg will not want for turners of the grindstone, apart from the "dingy exterior of Austin Friars, or of smoky London." ENGLISH MINER.

BRITISH CAPITAL, AND AMERICAN MINES.

SIR,—As it is essential for the prosperity of the mining industry generally that some better system of transferring mining property should be devised, nothing appears to me to be more necessary than English captitalists should have the earliest information with regard to any negociations, or alleged negociations, going on with a view to place American mines on the London market. In Colorado, and especially in the Leadville district, there are innumerable mines that could be worked remuneratively with British capital, but the English must be cautious not only in their selection but in ascertaining the intrinsic value of the properties offered. They may accept it as an axiom that nothing is worth buying at a higher price than $100,000, and for this reason. If a mine is so far developed that ore is within reach to the extent of $1,000,000 no American is sufficiently philanthropic and non-commercial to sell. Every miner knows that in such a case the necessary machinery and working capital could be had on credit and loan in either Colorado or in San Francisco, so that there is no need to part with a good thing. But when a mine is nearly worked out, as was the Emma, of Utah; and some others which are not unfamiliar to the readers of the *Mining Journal*, then the English are just the kind of fish to take the bait—they like a going concern, and are not always careful to consider whether it is going too much and going to ruin. It was asserted here that the English had taken to the Robert E. Lee, the Scooper, and the Matchless Mines, all of which have returned enormous profits, but are not in a position to do so much longer; in fact, all the cream has been taken off each, and nothing but the very weakest buttermilk remains for the future workers. A special despatch from Leadville altogether denies the sale of the Robert E. Lee, and I cannot but congratulate the English if the bargain is off.

That the English syndicate should, as the New York Financial and Mining News states, want to be on the safe side is not surprising, but it seems that this a case of a certain class of persons falling out that honest men may be secured their rights—that is, prevented from losing what rightfully belongs to them. The despatch in question says that, according to Mr. Homer Pennock, the sale of the Robert E. Lee, the Scooper, and the Matchless Mines to the English syndicate has been consummated, the price agreed upon being $5,000,000. Mr. Pennock's statement is not believed in well-informed circles, and your correspondent has the best of reasons for doubting its accuracy. Neither the Robert E. Lee, nor the Scooper, nor the Matchless has yet been transferred, nor does it now seem that anyone of them will be. From an intimate associate of Mr. Roudebush I learn that the English parties are only willing to purchase the properties conditionally upon verification, by actual production of, the reports made upon them, each instalment of the purchase money being made as the bodies of ore which are said to exist are actually uncovered. Governor Tabor, for reasons that are doubtless conclusive to him, refuses to accept these terms as far as the Matchless is concerned, and will withdraw his property if they are persisted in. Roudebush and Pennock, on the other hand, are willing to compromise on the basis of one cash payment, and the balance as asked by the English parties. So the matter rests at present, and meanwhile a most mysterious silence is preserved by all hands.

Now, $5,000,000 would appear to be a fatal amount, for it is just the amount for which the famous Emma was sold, and until the California of Colorado, the Kohinoor, and Donaldson, the La Plata, and innumerable other concerns at present in English hands have done something more in profit-earning upon English account than the unfortunate shareholders have yet heard of, it would probably be well if Englishmen were to keep their spare millions at home. Not long since the fashionable promoters' inspector was Mr. Reuben Rickard, formerly of the Richmond Consolidated, and his views seem sound and businesslike. He has just now been talking very freely, says the authority already quoted, to the reporters of the Western papers, and to the representative of the Denver Tribune he is credited with making the following statements:—"You see no big frauds have been perpetrated by the Americans of late, and the Englishmen are beginning to believe that your mines have fallen into better hands. I also believe this to be a fact that I am in a position to know that so long as honest men handle American properties and the sharks are debarred from operating English money will come over here in large amounts for investment. In less than six months if the present state of things is continued there will be plenty of English gold in this country to be used in mining. Mining for the precious metals is an attractive occupation for all Englishmen of means. It seems to fascinate them, and notwithstanding the fact that some of them have been badly treated and swindled in the United States, they are ready to embark again, provided reasonable security is given for the safety of their money. They are growing more cautious, but will put in large sums when they are satisfied that they will derive a revenue by so doing."

The interviewer then enquired, it seems, what the English considered to be reasonable security, to which Mr. Rickard replied:—"There are a great many things to be looked after. An English investor will not pay over any money now unless he is first handed a patent title to the property he buys. He must have Government security. Location certificates will not answer the purpose. Too many men have accepted them as guarantees of undisputed possession, only to find that their claim was lapped, and that all that was left them to work on was the prospect shaft. No, they must have good and clear titles or they will not buy." "Englishmen have also learned to send over good and reliable experts to inspect the properties they propose buying," continued Mr. Rickard. "It must be proved to them that they are buying mineral and not worthless rock. Then, too, the condition of things about the mine must be enquired into—the cost of supplies, the wages paid, and the climatic changes must be looked into."

Now, I think Mr. Rickard has entirely missed the mark. It is not the difficulty of obtaining a good title that prevents English capital flowing into the State, but the exorbitant premiums charged by middlemen and promoters—Americans and English working in common accord to victimise the British capitalist. There are many good mines now idle in Colorado which can be had for little more than the price paid for securing the United States patents for them, and if the owners could but obtain working capital the Englishmen would obtain a handsome return for their money, the working miners would be better employed, and the vendor, taking a share of the profits as his remuneration, would receive much more than he gets at present through the middleman. Then would American mining become in high favour with British capitalists, and the increased application of capital to industrial development in the United States would benefit the whole community.—*Leadville, Sept.* 8. KELT.

THE TRADES UNIONS CONGRESS.

SIR,—That the existing relations between masters and workmen are most satisfactory throughout the country may be gathered from the fact that a great portion of the sittings of the Trades Union Congress last week, at Nottingham, was occupied in discussing political matter. There are evidently but few trade grievances to complain of; but of course there is always something to be done for the unfortunate miners—one of the best paid class in the kingdom. For several years past at all such meetings there has been an outcry for more mine Inspectors, and it was again brought forward last week by a delegate from Northumberland, who contended that 24 Inspectors and sub-Inspectors was far too small a number. Mr. Crawfurd, of Durham, considered that if the number of Inspectors was increased the number of explosions would be lessened, and the loss of life reduced. From these opinions it would almost appear that there should be Government Inspectors constantly at all our mines to direct what was to be done so as to prevent the possibility of an explosion, which is simply an impossibility. But there are other causes of fatalities in mines that require far more looking after than the firing of gas. These explosions are now of comparatively rare occurrence, being far less frequent and not so destructive to life as they were 15 or 20 years ago, although twice the quantity of coal is now raised to what there was then. For these we are indebted to the many changes and improvements that have taken place in the working of our mines. The furnace system of ventilation by which the return air passes over and close to the fire is being rapidly superseded by the fan, which can send through the workings an immense volume of air, in some instances to the extent of 300,000 cubic feet per minute, whilst there is no danger from the return air, often so much impregnated with gas as to be explosive. Blasting with gunpowder has also been done away with in many of our mining districts, and before so very long promises to be altogether unknown, for the lime-cartridge is found to be equally as effective against nearly all seams of coal. These, and the enforcement of the use of safety-lamps have been the principal reasons why so few explosions have taken place of late. Nothing, however, was said at the Congress with respect to the most fertile source of death and danger in our mines, too often the result of negligence on the part of the men themselves. Deaths from falls of roofs and sides are almost of daily occurrence, yet there is nothing said about them, nor any suggestion made as to how the number of them can be sensibly lessened. But this is entirely a workman's question, for the miners' safety rests in their own hands, as a rule, and these are certainly not the safest—at least as far as relates to falls. Indeed, if the safety of the miners were left to them alone, there would be a far more serious loss of life than there is now from mining accidents. Of this we had a proof quite lately in the demand made by the miners in North Derbyshire for an advance of wages because they were forced to use safety-lamps. They preferred going in with open lights, although there has been more than one explosion of a fatal character in the district, owing to their use; in fact, to say that Inspectors can prevent explosions is, to say the least, most ridiculous, for even if there were one for every mine he could not in the nature of things be in a number of working places at the same time, and gas cannot be called from where it is secreted at the call of any man—Inspector or workman—for it comes when and where it is least expected, and all that can be done as a safeguard is to see that there is no naked light near to where it can make its appearance. But according to the Congress more Inspectors are necessary to prevent explosions, because they have greatly decreased of late, owing to improved methods of ventilating, working, &c.

To add to the cost of working machinery it has long been sought to have the persons in charge of boilers of a much higher standard than at present, and to make them undergo an examination before they occupied a situation where there were engines and boilers to be looked after. Recent legislation, however, has gone a long way in making boiler explosions a matter of rare occurrence, for a serious responsibility is thrown upon the owners of them. At the Congress, however, a resolution was passed to the effect that, owing to the frequency of accidents caused by machinery and boilers, and the consequent loss of life, legislative interference is necessary, so that a law should be enacted prohibiting any but duly qualified and certificated persons taking charge of steam engines and boilers. Explosions generally take place owing to some part of a boiler-plate being defective, which can only be discovered by frequent examination, as this is now the case with respect to all boilers. But all these proposals, so far as coal mining is concerned, are simply to add to the working cost of the mines, and are certainly not to the interest of the miner. The lower the ordinary working expenses are kept, exclusive of the actual manual labour, the better is the prospect of the miner as regards wages. But the Congress would appear to have met for the purpose of supplying Parliametary fuel for the next session, for several proposals were made and agreed to with respect to legislation. A resolution was consequently passed that a bill should be promoted to regulate the hours of all workmen in the employ of the State, or by a public body, or company requiring Acts or concessions by Parliament, and that eight hours be the daily minimum. We fancy these workmen will ask to be saved from the inteference of their would-be friends, and allowed to manage their own affairs. That there had already been too much of this interference appears to have been the opinion of some few in the Congress, for on a resolution being passed invoking legislation with regard to the employment of women and children, one of the delagates, a Miss Wilkinson, remarked that if all that the Congress required was done they would soon be in the position of not being able to eat or drink except by Act of Parliament. However, such resolutions generally pass off very harmless, there being a great deal more smoke than anything else, and despite the resolutions of the Congress, Parliament next session is not likely to be much troubled with any of them.—*Barnsley, Sept.* 18. J. R.

LIQUIDATORS RETIENCE TOWARD SHAREHOLDERS

SIR,—Like your correspondent "J. H." I too should be glad for information respecting the right of shareholders in the matter of winding up concerns. So far as my limited experience extends they appear to be quite at the mercy of the liquidator, and the shareholders have no control over his actions. I shall also be glad to know if directors can go into liquidation without the knowledge and consent of the shareholders?—*Barnstaple, Sept.* 15. D.

THE DOWSON ECONOMIC GAS.

SIR,—Amongst the correspondence in the *Mining Journal* of Sept. is a letter from Mr. Emerson, of California, asking for details of our gas through your Journal. We, therefore, enclose you a few notes on the subject, which will, we think, be interesting to your general readers.

The gas is made by passing a mixture of superheated steam and air through a mass of incandescent fuel. There is no exterior fire, and the cost of repairs is trifling. The apparatus is simple and easy to work. To make 1000 cubic feet only 13 lbs. of coal and about 7 pints of water are required. The steam can be produced and superheated in the apparatus, or it can be taken from a neighbouring boiler. The steam or water pressure required is about 25 to 35 lbs. The average cost of this gas is about 3d. per 1000 cubic feet, including an allowance for the wages of attendant, repairs, interest, &c. For general purposes about three and a half times, and for the Otto gas engines about five times more of this gas than of ordinary coal gas are required to give the same result as the latter. The price of 3d. should, therefore, be multiplied by 3½ or 5, or (say) 10½d. to 1s. 3d., for the equivalent of 1000 cubic feet of coal gas, which usually costs 3s. to 4s. This gas is free from tar and ammonia; it cannot burn with a smoky flame, and there is no deposition of soot, even when the object to be heated is placed over or in the flame. These points are important for nearly all applications of the gas, and especially

in gas engines, as the cylinder and valves are not fouled. Anthracite coal, costing an average of 14s. per ton delivered, is generally used for making the gas in this country; but where that is not available non-sulphurous lignite can be used as well as other fuel.

The introduction of this cheap gas will give a great impetus to the adoption of gas engines. Messrs. Crossley Brothers, the makers of the Otto type, are running five of their 16-horse power engines, as well as one or two of other sizes with this gas at the new works at Openshaw, near Manchester. They find the consumption of coal in the Dowson generator is only 1·2 lb. per indicated horse power per hour—a figure which is certainly remarkably.

DOWSON ECONOMIC GAS COMPANY (Limited).

Westminster, Sept. 15.

BRITISH ASSOCIATION—EARTHQUAKE PHENOMENA.

SIR,—With your permission I will make a few remarks on the futility of discussing the above difficult subject. I am very sure, judging from their writings, that if the members of the Association discussed for a week, their want of knowledge of the nature, strike, and chemical combination of the numerous and various matrices of the veins in their passage through the various rocks and strata of the earth would only be to mystify and misrepresent the cause and effects. All that has ever been written by them (passing description), is the most theorising nonsense that ever was published. The want of knowledge of the combined power of mixed acids, as shown by the late ignorance of explosives, is a convincing proof of it, and the utter want of knowledge of the power of electricity when in contact with the gases of these powerful acids when in combination which prevails.

The sulphurous gases, when discharging from eruptive veins, are proofs past all refutation that that combination has no limit, and when in a sufficient body of sulphur would be carried on the whole length and extent of the vein. If there was any volcanic body in action in the centre of the earth the whole of those beautiful chemical combinations of matrices of veins would be totally destroyed.

It is, no doubt, most truthful that "if the Association would limit itself to the safe ground of ascertained facts, or only step out of that into the region of avowed experiment," we should have some reliance on their statements. GEORGE ATTWOOD.

Grange-over-Sands, Sept. 17.

SAFETY APPLIANCES FOR GIGS—MR. TIDDY'S INVENTION, AND HIS CRUDE IDEAS.

SIR,—Whilst writing this my eyes are still dazzled with effulgence from a star of the first magnitude that has recently burst forth from the world of invention. From the contents of a letter in the *Mining Journal* of Sept. 8, signed by Mr. J. F. Tiddy, Trevithick has a worthy successor. Elijah's mantle has found a worthy resting place on that ingenious gentleman's shoulders. Complaints are incessantly made as to the primitive style of the Cornish winding gear; but, lo! and behold one has arisen in our very midst who is likely to revolutionise the whole world of mining machinery, and shake it to its very foundations. List to the words of the charmer—"The man-engine can be utilised for the purpose of drawing up the mineral ores, that intermediately as well as that of conveying the men up and down from the surface, thus economising the expenditure in machinery, which at all times is no small item in our mining operations. Good, good, brave Mr. Tiddy. If this gentleman can substantiate this statement, well, then—using a Yankee phrase—he has "struck ile." But he leaves us poor benighted denizens in this "vale of tears," in a fog as to how the man-engine is to convey the mineral ores to surface, whether they must be carried in bags on men's backs, or shovelled from one step of the man-engine to the other; or, even better still, he may have an automatic machine in his mind's eye to execute all this. If so, we as miners will prostrate ourselves before this inventive genius, and proclaim him a benefactor of his race, and blazon his fame abroad—through a penny trumpet.

By far the most important portion of his valuable epistle is that when he states, without a shadow of egotism or a wish to be thought vain or pedantic—"After some cogitation over safety appliances I am led to believe that the apparatus which I have designed cannot fail to suspend the cage the moment any accident occurs to the rope." As Mr. Tiddy is really anxious to have his views criticised by experienced men, I as one of my lifetime as a miner am willing to do so. Moreover, I have seen the best of English safety appliances, and claim a little knowledge of their respective merits. I learn from a short paragraph in a local paper that Mr. Tiddy's invention consists of two automatic plate springs, and two spiral ones attached to the top of the cage and in connection with the rope. In the event of the rope breaking the machine goes off with a whir, when catches shoot out and catch the guides. A parallel case to the machine going off doubtless many can recall, that of the spring of an American clock breaking on a winter's night just when one is dozing off to sleep and had to get up in the morning to catch an early train, and that very same clock was the only reliable authority in the house whereby to tell the time of day. Without attempting to filch one iota from the originality of conception of Mr. Tiddy's invention, springs have been tried before to effect the object that gentleman has in view. Without at present giving an opinion on them I would offer a very mild suggestion that Mr. Tiddy submits plans of his wonderful invention to Capt. Trevena, the manager of Wheal Agar, who I feel sure for humanity's sake will have a cage fitted up with the machine at once, and let Mr. Tiddy, on the quiet, insure his life for a good round sum, and be the first one to try it in the cage himself. Such a noble sacrifice of life, or prevention of it—I venture to say if the latter were the case would do more to popularise his machine than columns of writing, or all the blowing that he can do about its merits. Moreover, if success should crown his efforts, in future ages when our progeny are gazing at his bust in a conspicuous place besides that of Trevithick, Watts, and Co., they will be led to exclaim—this truly was the miner's friend—and "a friend in need is a friend indeed."

Finally, from Mr. Tiddy's letter he has gone into gravitation, and the speed of falling bodies according to their density. I would ask him a test question. Supposing a man (10 stones in weight) had half a gallon of high-pressure ginger-beer in his stomach, and another exactly the same weight had the same quantity of Jamieson's double distilled, why should one gravitate by mother earth quicker than the other if, as he says, all bodies of equal density fall at the same ratio.—*Perranporth, Sept.* 18. W. NINESS.

PRACTICAL REMARKS ON THE PROCESS OF TIN FROM THE LODE TO THE TIN-HOUSE.

SIR,—Columns have been written on this vastly important subject and respecting the large quantity of tin washed down the rivers; the following form an experience of 30 years will be borne out by all practical miners (perhaps not by theorists), and may contain interest to the readers of the *Mining Journal*. The first and fundamental point to be considered in the process is the classification of the tinstone for the stamps, and which to my knowledge in many cases does not receive its proper amount of attention, and in others ignored altogether. I am speaking advisedly, as the whole of the tinstuff in many of the mines is put through one sized grates regardless of grain or anything else. Many of the tin mines have different charactered tinstone as to size of grain, even in the same lode, and in many instances mines have different lodes and different gangue, which most certainly ought to be considered when going through the stamps—to wit, tin in capels almost without exception, is of a fine grain, consequently, requires to go through a very fine grate—say, a 36 holes to the inch, whereas there is tin which requires to be put through larger grating (33 or 34), and others larger still. This first stage in the process—that of classification—I consider and have proved of the most vital importance to the returns, as unless it is attended to there must be a very serious unnecessary waste of tin. This can only be accomplished by a strict supervision over the grates, and in very many mines in the county it would effect an immense saving.

If fine-grained tin is being stamped through a 36, when the grate has been in use a few days (experience will say when) it ought to be taken out and turned upside down, and when it has worked in this position the same time the holes become too large and the grate must be changed for one of its original size. As copper grating is an expensive item, these once 36 grates being too large for the stuff they were stamping, ought to be moved to the next larger size, and so on. If this routine is carried out to the letter the rivers would not receive the quantity of tin they do, and there would not be found in the tails of the buddles anything like the quantity of stuff that now requires a second course of treatment for refining, and consequently decrease the cost paid in sadly too many instances for that in the heading of my letter. Others to follow on this subject.

Illogan, Sept. 18. EDWARD MOYLE.

CAUSES OF DISAPPOINTMENT IN MINING.

SIR,—Will you allow me space for a few remarks on two letters which have lately appeared in the *Mining Journal*—one from Mr. John Roberts, of Llanrwst, headed "Causes of Disappointment," the other signed "H." Mr. Roberts says, "Let every intending investor make every possible enquiry of persons qualified to judge, &c.," "H." says, "Many investors say it is difficult to get sound information; but despite a recent effusion to the contrary, there are still many honest dealers and brokers who would afford it." Now, it appears to me very disappointing that these gentlemen stopped there and did not tell us who "the people qualified to judge, and honest dealers and brokers" are, since no doubt many are in similar case to myself, quite ignorant whom to consult and trust. In 1879 and 1880, on the strong recommendation of a firm established 30 years ago, I invested in three mines. One has been on the "eve of a great discovery" for four years and a half, but unfortunately always remained on the eve; and from a circular received to-day I see it is put off for 12 months. The other two have gone into liquidation. Of one no one can obtain any information, excepting that it requires more money to carry it on. The other does appear to be at work, but without so far doing anything particular by it. Will these gentlemen take pity on—

Kettering, Sept. 18. M. B. T.

DERIVATION OF HUEL OR WHEAL.

SIR,—I am glad to see in the *Mining Journal* a discussion on the word "huel" or "wheal," applied to a mine, as it may be the means of attracting the attention of a Celtic or Welsh scholar, who would be best able to elucidate the question. "Anglesey Miner" makes an ingenious suggestion, especially as "gor" is used in Welsh as an intensitive prefix; but I have strong reasons for thinking the word "huel," in its primitive tense, indicates a physical character of the locality to which it is applied. It can be detected in the names of places in most countries that have been inhabited by Celts, appearing in Wales at the present day under the form of Howel. The name of a celebrated professor, Whewell, said to be more easily whistled than pronounced, no doubt was derived from a similar source.

Some years ago I saw it stated that the old Celtic name for Exeter was "Pen-huel-gerte." "Pen," of course, represents the bluff on which the city was built, and I have been informed that "gerte" means ivy. The further question is, what does "huel" signify in the compound expression? "Huel" is one of the Celtic names of the sun, having analogues in the classical languages; but this must be quite another word.

It is new to me that "bal" means pick or shovel (two very different tools) in old Cornish. The usual meaning of "bal" in the Celtic languages is that of a building. C. O. B.

London, Sept. 15.

THE DERIVATION OF HUEL AND WHEAL.

SIR,—It is said—"When doctors differ, who shall settle the question?" I do not expect by any means that I am going to settle this question. I believe that it is generally agreed by your correspondents that the meaning of the words is the same; but it is at the root that they are pegging away. Your Anglesey correspondent in last week's Journal gave a very fair idea, but I would rather suggest that the root of the word is "hwyl"; for, taking into consideration the excitement which is caused by the changing condition of mines, no word could be more expressive than this of the feeling and action of those interested in the Gorchwyl; and it is quite possible, if that the original word was Gorchwyl, that they would soon, after a few successes and a few of the old sort of dinners, change it into "hwyl."

Llanrwst, Sept. 19. JOHN ROBERTS, M.E.

MINING NOTES AND RECOMMENDATIONS.

(WEARDALE.)

SIR,—I have previously drawn attention to the extent of this company's property and also to its returns in the past, and now it will not be unprofitable to glance at the outlook. The commercial value of these mines is undoubtedly sound for the development of the property, is comparatively in its infancy, and a vigorous and judicious exercise of the miners' skill will lay bare resources which have not as yet been entrenched upon. The conditions of tenure are more favourable than those possessed by the late lessee, and the lease is for 60 years. The reports of Messrs. Stewart, Blenkiron, and Trelease are very satisfactory; but, though confessedly too short for a full description of the mines, they are sufficiently comprehensive to convey a good idea of the magnitude and importance of the undertaking. The whole of the property is intersected by a series of well-defined lodes, remarkable for their uniformity and masterly appearance, rich in the shallower levels, but richer still in depth. It is the opinion, not only of these gentlemen, but of others, that it would be difficult, if not impossible, to find richer silver-lead lodes in the United Kingdom than those which are to be found in the Upper Wear district. There are no less than 36 lodes enumerated in the published reports, and these by no means include the whole. Some of the lodes have been worked for hundreds of fathoms, while there are others quite intact, which have a run for miles. The workings are of the most inexpensive character, being carried on by means of adit levels; and all that has been done in mining goes no deeper than water levels.

Captain Trelease says—"These mines embrace the most extensive operations I ever saw, and a very large proportion of the grant is yet untouched. I was surprised to notice so little work accomplished on the line of the lodes at surface in such a great metalliferous centre where lodes may be met with by a very insignificant outlay that would make history repeat itself." The lodes for the most part run east and west, parallel and in close proximity; numerous leaders frequently are found about them, many, like the master lode, being very rich for metal. Operations have been confined to Killhope Head and Green Laws, in Weardale, and Grove Rake in Rookhope Valley. Several of the mines have not been worked for some time; but at a small outlay they can be opened, and could no doubt be made to return large quantities of ore. One mine alone has been valued at 50,000*l.*, and Capt. Trelease says that these "mines are not poor for want of ore but for the want of development." Some of the points are very productive; in Green Laws the stopes are estimated at from 1 to 4 tons of lead per fathom. Mr. Blenkiron mentions six mines with these remarks—"I may say that each of these properties constitutes a large mining field, both as to extent of ground and number of veins or lodes passing or running through them." Mr. Stewart says—"I spent two or three days inspecting this field, and all that I could learn in that short time was how little could be fully grasped of its great resources without a study of weeks or months."

It is suggested by these gentlemen that from 500*l.* to 1000*l.* should be spent monthly in opening out this property, and in the course of two to three years the mines will have returned to their former state of profitableness. The ore crushing and dressing appliances are of the most approved principle. There are extensive smelting and refining works, the internal arrangements of which, at a small cost, could be greatly improved. Opinions are unanimous as to the wealth of this district, and this is supported by the fact that enormous profits have been made. As much of the estate remains undeveloped, yet bearing all the evidences of splendid deposits of ore, and the mines in operation being only partially worked the prospects of returns are of no mean order. It remains to be seen how far the directors and the staff avail themselves of the advantages which they possess in the proper working of this large area of mining ground. The directorate are all that could be desired, the whole body having had great experience in the control of some of the best mines owned by British mining capitalists. There has been so much questionable mining that the public have become disgusted with mining in consequence; and now we need the beneficial influence of sound properties well worked to restore the equilibrium of healthful mining adventure. None know this better than those associated with the London Mining Market, and I am fully persuaded that the representatives of mining enterprise have a remedy in their own hands. E. R. GABBOTT.

LEAD MINING IN CARDIGANSHIRE.

SIR,—I suppose it must be the stagnation in lead which seems to have paralised the correspondents who were wont to cheer the hopes of shareholders, and at the very time good and sound advice is wanted, no one seems to have the heart to give it. Now, it is a well-known fact that when we get to the lowest price, and, in fact, lower than the productive price, a reaction must set in sooner or later to the benefit of those who have supported their own properties, provided they have just a little faith to keep the concerns going; but, unfortunately, this is not the present opinion of investors, who look upon such matters in the darkest colours—consequently, it is to be feared that many good and sound undertakings will be wound-up, when by a little exertion and at a present small cost to the shareholders the whole could be saved and to lasting benefit.

It is to be hoped that deserved success will crown the Goginan Company, who have got a discovery of importance sufficient to warrant continued confidence. At the adjoining mine—the Bwlch United—the lowest level is 80 fms. above the discovery at Goginan, and is improving. If the shareholders support the mine I have no doubt they will be very handsomely repaid; if not they will leave it for others to enrich themselves, in a measure at their cost, since all agree that at the junction of the lodes at the 100 fm. level large bodies of ore will be secured, and that at a comparatively small cost. There are many more sound undertakings languishing for want of means, and the only hope is that the long-looked-for advance in lead will shortly commence.—*Mincing-lane, Sept.* 17. M. C.

CORNISH MINING—NEW TRUMPET CONSOLS.

SIR,—In every class of enterprise there are fluctuations of activity, periods of animation, and periods of depression. Careful observation of these alternations secures for the investor favourable opportunity for action. "History repeats itself" is applicable as much to the records of Cornish mining as to any other class of enterprise. Various influences, political and commercial, have repressed enterprise for some time past, and we are just emerging from a long period of utter stagnation. There are many indications that a period of activity is approaching, and the prudent investor will now be on the look-out for promising channels of operations. At the present price of metals, and with the firm tendency of the markets, the immediate future of Cornish mining is far from discouraging, and one or two old-fashioned discoveries only are wanted to give to it great impetus and activity.

Great outcry has been raised against Cornish mining; but we maintain that, properly conducted, it is one of the most legitimate industrial enterprises of the country, and although we admit of late years the prizes have been few, yet there have been prizes that have well repaid patient industry, and one prize compensates for many blanks.

We desire now to invite attention to a few properties that hold out promise of great and speedy success. Foremost of these we place New Trumpet Consols, and refer to the report of the meeting held on Sept. 6. Anyone well acquainted with the rich mining districts of Cornwall will not need to be told that this mine is situate in one of the richest districts, and if "history repeats itself" the shares of this company, which are each 1*l.* fully paid, may very soon command a much higher market price than at present.

The present Limited company took over the property from a Cost-book company, and have carried on operations with great intelligence and economy. All requisite machinery is on the spot, and, what is of vital importance, there is ample water-power and suitable machinery to carry on operations to a great depth. There is also ample capital in hand. From present workings some good parcels of rich copper ore have been sold, the last realising the extraordinary price of 11*l.* per ton; but the spirited proprietors (of whom the largest are Messrs. Rogers, of Helston, and Mr. E. J. Bartlett, of London) are looking forward to rich deposits of tin being found under the rich bunches of copper now being met with. This is almost invariably the case in this district, as the history of many rich mines has proved. There is not much doubt that purchasers of the shares at present prices may have reason soon to be satisfied with results.

Amongst other low-priced shares worth attention at the present time we may mention the group of the Caradons—New Caradon, West Caradon, and New West Caradon, also Prince of Wales—all of which bid fair to show results that will well repay the patient enterprise that has thus far developed them, and investors coming in at the present moment of very low quotations are likely to realise results highly satisfactory. A period of highly inflated prices when everything wears a florid aspect is indeed not the time to buy, but the investing public are slow to realise the fact. "When things are high the public buy, and when they are low they let them go" has too often been their plan of operation. Now is the time to select a few good stocks at low prices, on which good profits may be anticipated, and foremost amongst these we place New Trumpet Consols, and invite careful study of the report in the *Mining Journal* of Sept. 8.—*Palmerston Buildings, Sept.* 14. VERITAS.

[For remainder of Original Correspondence see this day's Journal.]

PHOSPHOR BRONZE.—The constantly extending use of phosphor bronze alloys in connection with the manufacture of machinery, and the desirability of selecting an alloy especially suited to the purpose for which it is to be used renders an account of the particular characters of the ingots of each number, as manufactured by the Phosphor Bronze Company of London of general interest. It appears that No. I. is adapted for rolling and drawing into wire, sheets, rods, and tubes of every description, eccentric strap liners, springs, screws, bolts, and the like. No. II. is suitable for propellers, pinions, valves, steam and boiler fittings, pumps, bicycle and tricycle hubs, ornamental castings, harness and coach furniture, miners' prickers, locks and keys, and also various parts of machinery. This is a very strong metal of extremely fine colour, and is very much superior to gun metal. No. IV. is a harder alloy than No. II., and suitable for cogs, plungers, cylinders, and large pinions and pumps. It is mentioned that No. VI. must be cast in chill (iron moulds) and not in sand. It is then immensely strong, and is largely used for bolts and purposes where great tensile strength and toughness are desirable. No. VII. is a hard and strong alloy, extensively used by the British and foreign Governments, who specify it for hydraulic pumps, slide faces, crank pin bearings, tools for gunpowder mills, worms and worm wheels and bearings, and bushes for gun carriages, and for steel shafts running at great velocity, piston rings, and so on. It is claimed that No. XI., special "phosphor bronze" bearing metal, wears more than five times as long as gun metal, and is expressly adapted for bearings of every kind, slide valves, eccentric straps, bushes, and other parts of machinery exposed to friction. This alloy has a world-wide reputation amongst engineers and railway companies. Duro A is a very dense metal, adapted for bearings carrying heavy wheels at great velocity, mill and forge bearings (except hot necks) carriage and wagon bearings. Duro B is specially intended for the bearings of hot neck rolls, and for all bearings having to withstand great pressure, such as plate and sheet roll bearings, and for general engine purposes, in cases where the No. XI. alloy has not given entire satisfaction.

Messrs. Goodwin Brothers, steel and file manufacturers and merchants, of the Scottish Steel and File Works, Sheffield, announce that they have opened a London office, at Ludgate Circus, and appointed Mr. W. L. Raimbach, formerly with Messrs. John Vernon, Hope, and Co. (Limited), engineers, manufacturers, and South African merchants, of London, Wednesbury, and Kimberley (S.A.), to be their representative in London.

THE COPPER AND OTHER MINES OF NEW ZEALAND.

That the resources of New Zealand, both as regards coal and the precious metals, will have been seen from the exhaustive details given by Mr. Bramall in those portions of his memoir which have already been abstracted and published in recent Journals, and the notice of his paper will be suitably concluded by referring to what he says about New Zealand metals and minerals other than coal, gold, and silver. He states that the most abundant and important ore of copper is the double sulphide of copper and iron—copper pyrites—which when pure contains about 34 per cent. metallic copper. It is usually found so mixed and interspersed in the gangue of the lode that it is more economical to treat the stuff without incurring much expense in dressing to a high percentage, Cornish ores being seldom dressed to more than from 6 to 8 per cent. metallic copper. Of less, though still considerable, importance are native copper, copper glance, cuprite, and crysocella. Copper in all these forms exists in New Zealand.

In Auckland, at Kawau, the earliest discovery was made, a mine being opened in 1842 on a well-defined lode 8 ft. wide, which was worked to a considerable extent. The ore was copper pyrites, which yielded at first 16 per cent., but fell afterwards to 5 per cent. It was shipped without selection or any attempt at concentration, and after about 2000 tons had been extracted the mine was abandoned, and has never been reopened. At Great Barrier Island the Otea Mine was worked for some years in a breccia lode carrying copper pyrites with some carbonates and black oxide, assaying 24 to 28 per cent. metallic copper. The mine was opened by a local company, and then passed into the hands of an English company, who erected very costly machinery, but after producing 2323 tons this shared the fate of the Kawau. Dear and scarce labour and fuel are the causes to which these failures are attributed.

In Nelson, at Dun Mountain, the Maitai slates rest upon serpentine, which passes into dunite, an olivine rock, closely resembling lherzolite, and in the serpentine numerous irregular pockets of cuprite and native copper have been found. So long ago as 1856 a consignment of these ores was sent to England, and resulted in a company being formed to work the mines. It is said the capital of the company was frittered away without any systematic exploration of the ground being made, but there does not appear to be any evidence that any true lodes exist in this district. One thing is certain the operations of the company were unsuccessful, and the mines have been closed and abandoned for many years. Quite recently Mr. Newport has been prospecting the ground, and discovered several outcrops, but nothing apparently very encouraging. In the Aniseed Valley a lode has been discovered, and traced for some distance by Mr. Stratford. It is named the Champion lode, is 5 ft. wide, and carries cuprite and native copper, and some specimens are reported to have yielded 90 per cent. of metal. In Hacket Creek there is a remarkable deposit, consisting of a dark green granular serpentine, in which are embedded numerous grains of metallic copper, amounting to from 2 to 6 per cent. of the whole mass. The belt of serpentine which occurs at Dun Mountain extends northwards to Croixelles and through D'Urville Island, and the existence of copper in the serpentine at the south end of the island has been known since 1859. Recent explorations have revealed the presence of at least two well-defined lodes, though the ore deposits are very patchy and irregular, varying from 1½ to 6 ft. in thickness, and being sometimes pinched out altogether. The ore near the surface is cuprite and native copper, coated with carbonates; somewhat deeper it becomes copper glance, while at the lowest depth yet attained the sulphide is mixed with native copper. The produce varies from 6 to 24 per cent., but there would appear to be no difficulty in dressing it to (say) 25 to 45 per cent.: 50 tons from near the surface, and only imperfectly picked, were sent to Melbourne and smelted, yielding 10 per cent. metallic copper. At the Pioneer Claim, Bedstead Gully, near Collingwood, a band of quartzose schist in the felspathic rocks is traversed by thin bands of quartz, carrying copper pyrites, worth 29 per cent. copper, but the ore was found to be so patchy and irregular that the working was unremunerative, and was abandoned.

In Westland, in the beds of several rivers near Mount Cook, rolled pieces of copper pyrites have been found, but the lodes whence these have come have not been traced. At Paringa river, near Jackson's Bay, Mr. McFarlane reports the discovery of a well-defined lode at the junction of the mica schist and slate. It is 3 ft. wide, of which one-half is a solid rib of pyrites, yielding 18·5 per cent. copper, the remaining half being quartz with strings of pyrites. Other samples from this locality have given 19 to 26 per cent. The same gentleman sent a sample of copper glance from Big Bay to the Colonial Laboratory which assayed 67 per cent. metallic copper.

In Otago, at Reedy Creek, Waitahuna, a lode was discovered by some diggers who had "wingdammed" the stream in pursuit of their occupation of gold washing. The country is grey quartzose or mica schist, and the lode which is 4 ft. wide carries copper and iron pyrites assaying 14 to 18 per cent. A company which has undertaken to work this lode has just completed the necessary machinery, and will shortly test the commercial value of the discovery. At Moke Creek, Wakatipu, a strong lode is known, 4 ft. wide, with a rib 5 to 8 ins. thick of solid pyrites assaying 11·57 to 25·60 per cent. copper. At Dusky Sound, near Mount Solitary, a Mr. Docherty discovered a deposit containing copper pyrites at the foot of a spur or razorback ridge over 600 ft. high, and on the summit traced what seemed to be a lode. On blasting away the acute top of the ridge the lode became small strings running into the subjacent rock, and it appears not unlikely that the spur is really the footwall of a great lode, the hanging-wall and the lode itself having been denuded and fallen away. Samples taken from the fallen masses yielded from 3 to 18 per cent. copper. The lode has been traced some distance, and there are indications of the existence of others in the neighbourhood.

The ores of manganese are somewhat widely distributed, and those which are of commercial value—psilomelane, manganite and wad, occur at several places in workable quantities of good quality. In Auckland, about 4 miles from Russell, Bay of Islands, manganese ore is found outcropping in boulders in the slates of the upper Devonian, which forms the cliffs on the River Waikare, and mines have long been worked, and now employ about 50 men, and produce about 1500 tons per year. At Waiheke Island there are mines which yield about 40 to 50 tons per week. The ores are massive manganite and psilomelane and some wad. The other places in Auckland where manganese occurs are at Kawau (where it was formerly worked); at Pakihi Island in numerous small veins traversing the slates; at Whangarei; at Waipu; and in the Coromandel peninsula, associated with the gold reefs. Near Wellington, at Terawhiti, manganite has been found; and at Ohario it occurs in a thick lode traversing the slates and sandstones of the district. Manganese ores are known to exist, though not yet ascertained to be in workable quantities, near Napier; in Nelson province at D'Urville Island, and Bedstead Gully; in Marlborough at Tory Channel; in Canterbury at Malvern Hills, and in the Upper Waimakariri; and in Otago at Kawarau, Clutha, and Dunstan.

The large market in England for ores of good quality has stimulated research, and will, no doubt, lead to further discoveries.

The only ore of antimony which is of commercial importance is the sulphide stibnite, $Sb_2 S_3$ (Sb 71·77, S 28·23). The chief supply has hitherto come from Borneo, and a little from Hungary; but it is found in abundance at widely separated points in New Zealand. In Otago, at Stony Creek, near Waipori, in a country composed of friable decomposed schist, there is a lode 2½ ft. wide, carrying quartz with fibrous and compact stibnite and a little peroxide of iron. A lot of 4 tons shipped gave a return of 47 per cent. antimony. Vigorous measures are being taken to open up the mine, and the produce is to be shipped to London. The district is so inhospitable that probably no work will be possible for three months of the winter. At Hindon, on the summit of a spur in mica schist, is a quartz lode 18 ft. thick, with patches of stibnite; and at Alexandra, on the west bank of the Clutha river, a very fair lode has been recently discovered. The existence of a lode near Shotover has been known many years.

Chromium is somewhat extensively used in the arts, the market being principally supplied from Shetland. It occurs in the province of Nelson as chromite (chrome iron ore), and was discovered in 1861, by Mr. Hacket, at Aniseed Valley. The Copper Mining Company, at the Dun Mountain, during its short career, worked and exported about 5000 tons of this ore. It is found in a black granular, and in a brownish black compact form in irregular bands in the serpentine rock, and also as a constituent of dunite, a hard crystalline olivine rock occurring in bands, and containing disseminated crystals of chromite in quantity varying from a few grains up to nearly half the whole mass. The band worked by the Dun Mountain Company is 10 ft. thick, and that of the Roding River Company 15 ft. thick, proved to a height vertically of 300 to 400 ft.

The ores of lead and zinc are so frequently associated in the same lodes that it will be convenient to consider them together. No discovery of the carbonate has yet been reported in New Zealand, but the existence of galena has been know since 1859 when Dr. Hochstetter is said to have procured specimens from the Kaimanawa range, south of Lake Taupo, and it is now known to be pretty widely distributed. The only zinc ore yet discovered is the sulphide blende. On the Tararu Creek, Thames, a quartz reef formerly near the surface, richly auriferous, proves deeper to carry considerable quantities of galena, the ore assaying 40 per cent. lead with some copper, silver and gold. Blende also occurs here. At Tiki ore has been found giving zinc 46·1, lead 13·4, with a little copper and silver. And at numerous claims in the Thames field, as well as at Great Barrier Island, galena and blende are of frequent occurrence.

In Wellington, in the Upper Tararua district, West Wairarapa County, water-worn fragments of galena and blende have been found in the bed of the stream, but the lode whence they were derived has not yet been traced. In Nelson, at Wangapeka, at the Wakamarama range, and at Mataura Creek argentiferous galena occurs mixed with quartz, and blende at the Mount Arthur gold reefs. The most important deposit yet found is at the Perseverance Mine, near Collingwood. The main reef is 2½ to 6 ft. thick, filled with quartz and slate breccia, and, as already mentioned, when worked for gold resulted in failure. But at about 5 ft. above this reef is a band 5 to 6 ft. thick of blende and galena. The former varies in colour from black to light yellow, and yields from 59 to 65 per cent. of zinc. After remaining closed for many years the mine has been again taken up with a view to working this band. In Westland, near Hokitiko, at Abbey Rocks, and the Paringa and other rivers, galena has been found, and also at West Taieri, in Otago.

Tin has been long and eagerly searched for, and Dr. Hector states that the first trace of cassiterite was discovered in July, 1870, in black sand from the upper part of the Buller river. In 1876 Mr. Blair, C.E., sent a sample of stream tin to the Colonial Laboratory, which was stated to have been obtained from the auriferous gravels of the Tuapeka district. These discoveries were not confirmed, but in June, 1881, a sample of sand taken from the tailings from the auriferous cements at Lanky's Gulley, Reefton, was sent to the Colonial Laboratory, and on examination was found to consist of iron pyrites, titanic iron, and about 20 per cent. cassiterite. This discovery points to the existence of the mineral in the adjoining mountain ranges, and should stimulate further research, and may possibly lead to results of great importance.

With regard to mercury it is stated that on the south of Omapere lake, about 15 miles west of Bay of Islands, there is a conical hill, whence has flowed a stream of scoriaceous lava, from whose terminal end steam still escapes. Near by are the Ohaeawai sulphur springs, forming a small lake of 4 to 5 acres, the waters from which deposit a loose siliceous brown sand in layers, enclosing fragments of plants, and containing thin beds of cinnabar sand and globules of metallic mercury. The layer containing the mercury is only 4 in. thick, and confined to a limited area, so that attempts to collect it have not been profitable. From the same locality a specimen of impure idrialine cinnabar has been procured, resembling in appearance a dark fine-grained brown sandstone, containing 30 per cent. mercury and 21·5 of hydrocarbons; an interesting discovery, inasmuch as idrialite had previously only been known to occur at the cinnabar mines of Idria. In Otago, at Waipori, Serpentine Valley, and Dunstan rounded grains of cinnabar have been found in alluvial deposits, but the source whence they were derived has not been traced. Last year very promising samples of cinnabar were discovered at the Upper Nevis, yielding 84 per cent. quicksilver. In a country so largely employed in gold mining the finding of mercury in payable quantities would be of immense benefit, and it is much to be desired that further explorations may lead to this result.

Arsenic has been found native at Kapanga Mine, associated with gold, and is believed to interfere materially with the amalgamation process. Near Greymouth, at about 800 ft. below the Langdon reef, there is a lode of arsenical and auriferous pyrites, and detached crystals of mispickel are of not uncommon occurrence in many places. Cobalt has been detected, but in quite insignificant quantities in wad from Auckland, and erythrine is reported from the West Coast of Otago. Nickel to the extent of 2·98 per cent. was found in pyrrhotine from Richmond Hill, Collingwood; and a mass of serpentine rock near Mahurangi gave 1·81 per cent. oxide of nickel, but these quantities are too small to be of any present money value.

MANUFACTURE OF STRONTIUM SALTS.

In the manufacture of salts of strontia, and oxide of strontium, Mr W. A. ROWELL, of Newcastle-on-Tyne, has patented some improvements, which promise to be of considerable importance. Sulphate of strontia or celestine is ground and pulverised as fine as possible, and boiled in a strong solution containing carbonate of soda, by which a large proportion of the sulphate of strontia is converted into carbonate of strontia, and a similar proportion of carbonate of soda is converted into sulphate of soda. As soon as the chemical action has nearly ceased the solution of sulphate of soda and carbonate of soda is drawn off. The residual mixture of carbonate of strontia and sulphate of strontia is then boiled consecutively in other strong solutions containing carbonate of soda, by whicd the whole of the sulphate of strontia is converted into carbonate of strontia. The solutions of carbonate of soda and sulphate of soda resulting from the above operations are used to operate upon a fresh portion of pulverised sulphate of strontia, and by means of a continuous series of vessels (four is a convenient number), by the method well known to chemists, and consecutive presentation of the mixed sulphate and carbonate of strontia to the mixed solutions of carbonate and sulphate of soda, the whole of the carbonate of soda is converted into sulphate of soda, and the whole of the sulphate of strontia into carbonate of strontia. The proportions of sulphate of strontia and carbonate of soda to be used are their chemical equivalents with a slight excess of carbonate of soda so as to ensure complete decomposition.

The decomposition may be effected in one boiling, but requires a long time and larger excess of carbonate of soda. The solution used for the above purpose is either a solution of carbonate of soda or what is known in the soda trade as "tank liquor," which may be carbonated before use by injecting carbonic acid gas in any form. The carbonate of strontia resulting from the above operations may be used for the manufacture of other salts of strontia, and sulphate of soda may be reconverted into carbonate. Mr. Rowell is aware of the patent granted to Mr. David Urquhart, just previously to his own in the present year, and he does not claim generally the conversion of sulphate of strontia into carbonate of strontia by boiling the said sulphate with carbonate of soda, but what he claims is subjecting sulphate of strontia to repeated boilings with carbonate of soda, using successively solutions more and less spent by previous boilings and attacking with the fresh solution the nearly exhausted mineral, thereby obtaining the almost complete conversion both of the sulphate of strontia and the carbonate of soda, the one into carbonate of strontia and the other into sulphate of soda.

CORNISH WORTHIES.—Under this title a volume is about to be published by Mr. Elliot Stock, from the pen of Mr. Walter Tregellas. Few counties offer greater scope for the labours of an author in this direction, and the book will doubtless be acceptable to many readers of the *Mining Journal*.

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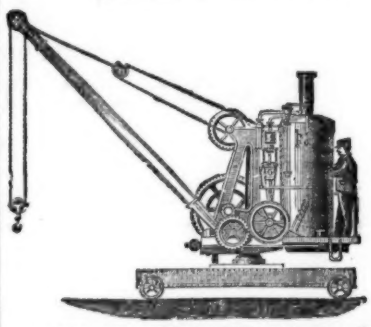

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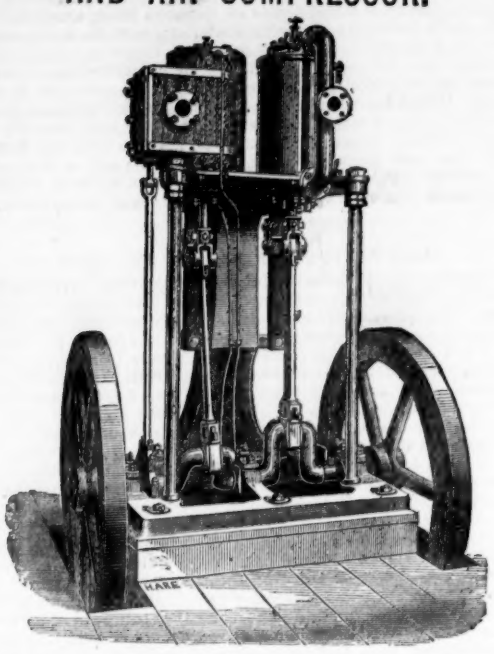

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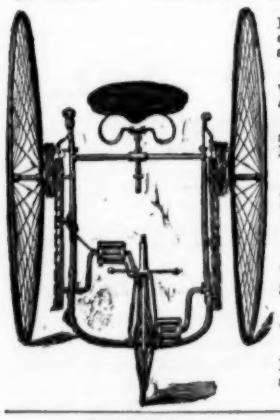

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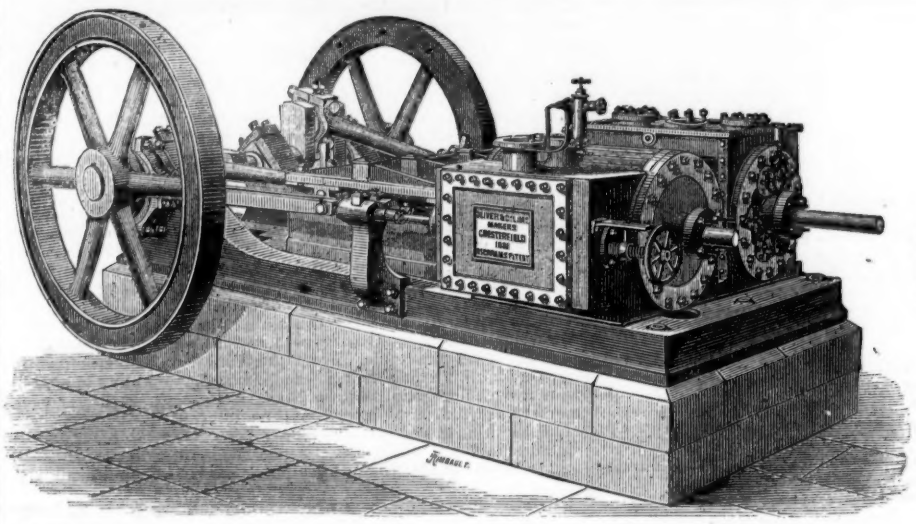

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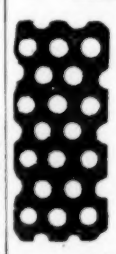

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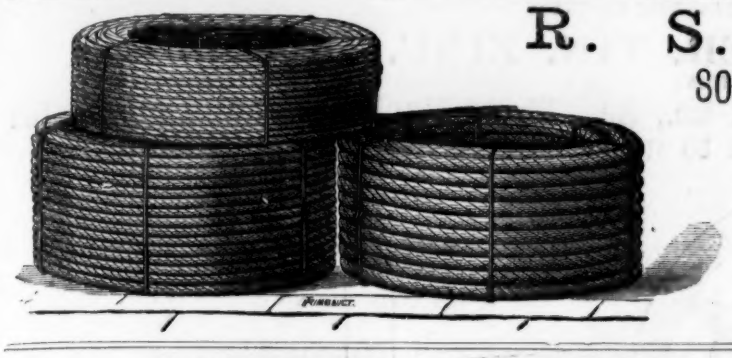

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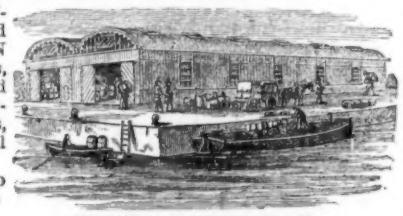

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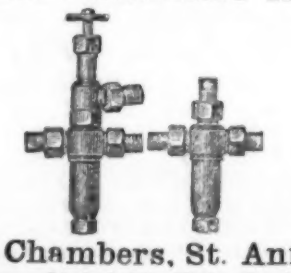

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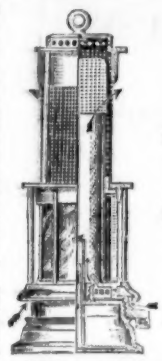

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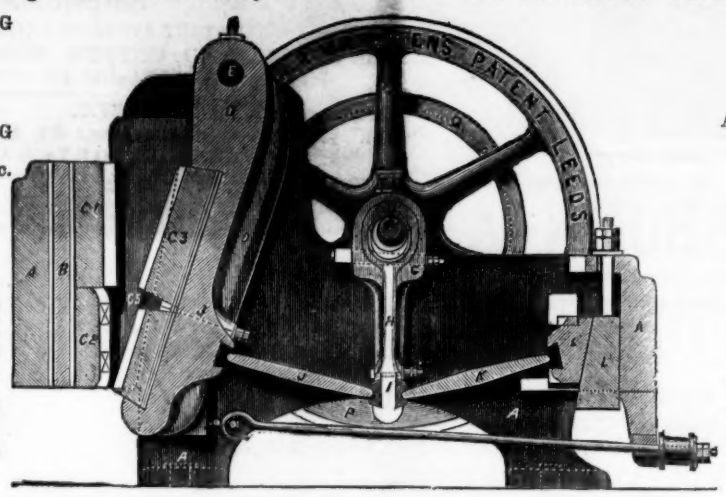

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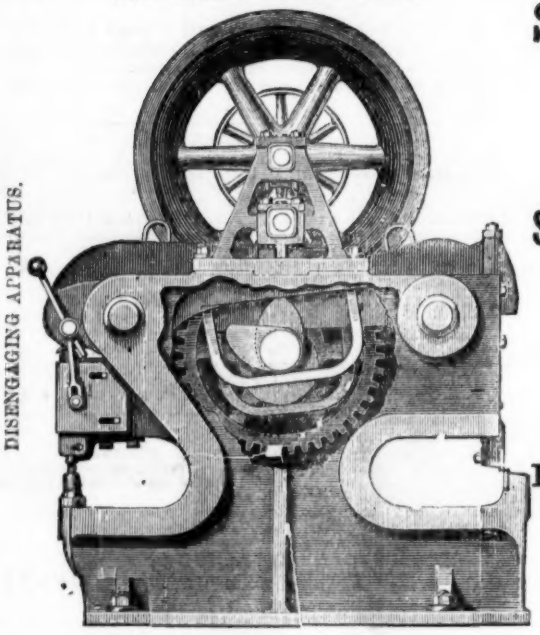

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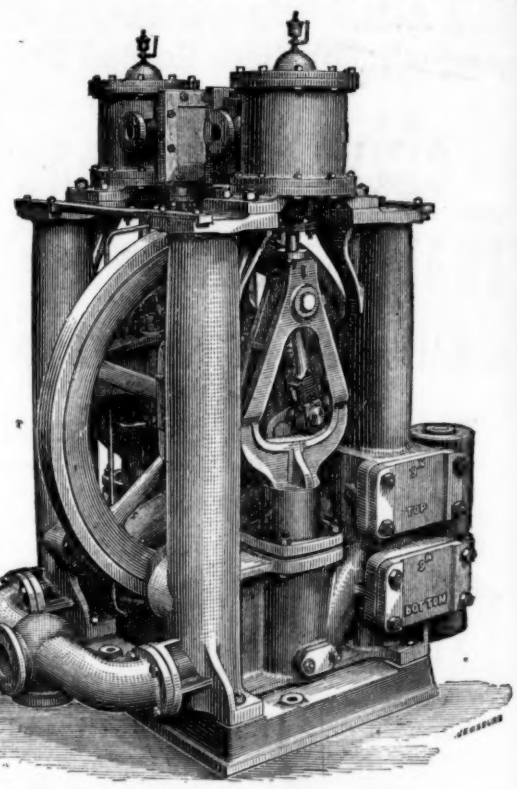

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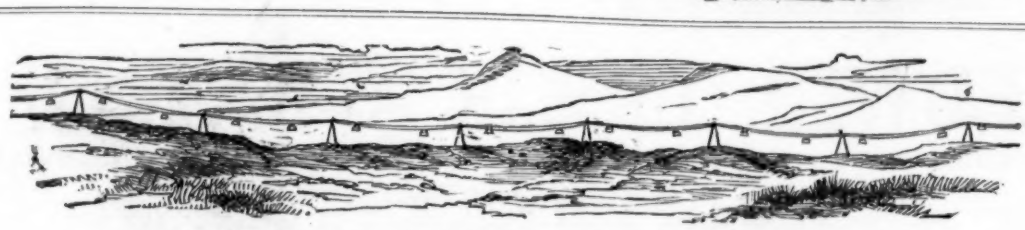

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